February 1983
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- Atari
- TRS-80
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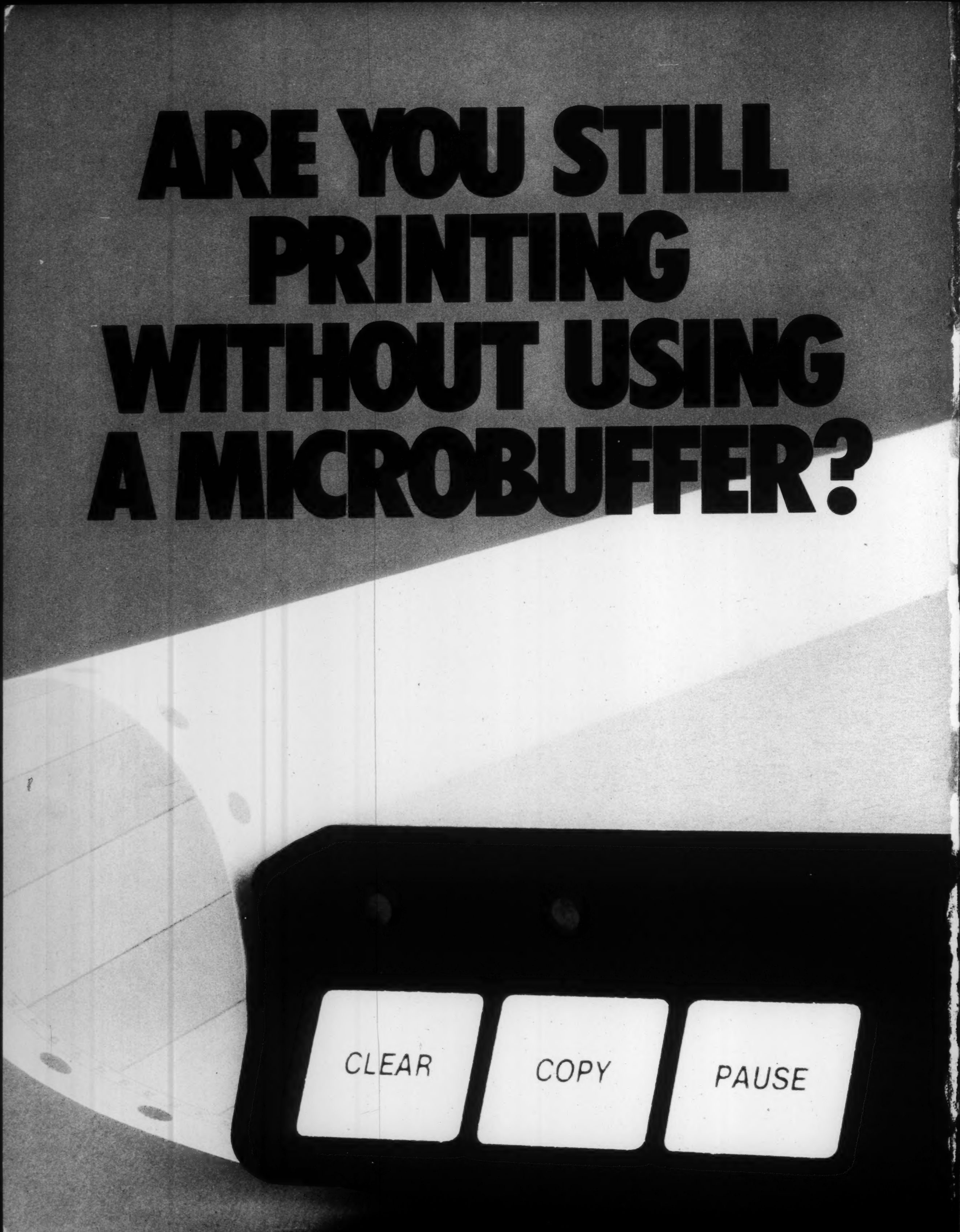
Cover Feature: Review of 17 New Apple Games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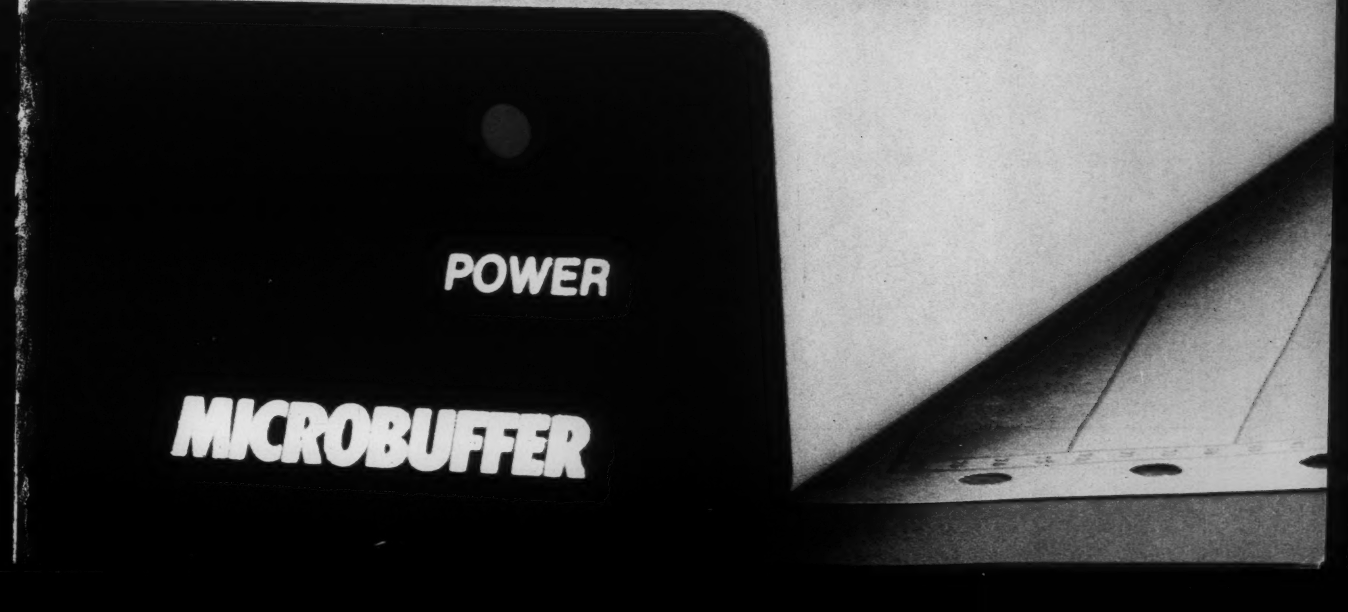

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Thanks and a tip of the hat to the following software companies whose packages are the basis for our fanciful February cover: Broderbund (Serpentine), Datamost (Money Munchers), Gebelli (Firebird), Hayden (Bellhop), Penguin (Pie Man), Sierra On-Line (Laf Pak), Sirius (Way Out), and Synergistic (Crisis Mountain). Illustration by Jack Moore. Reviews of these games start on page 88.

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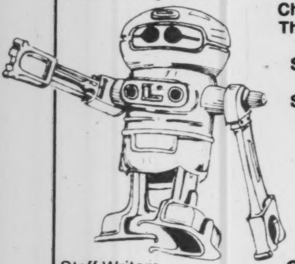

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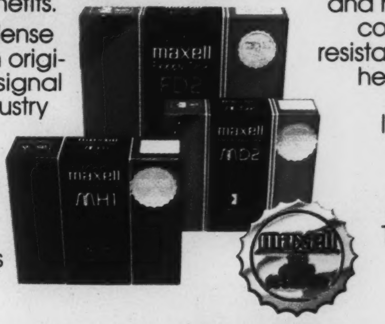
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Hurt Peelers' Feelings

Dear Editor:

In your October article listing the winners of the International Computer Problem Solving Contest II, the names of the members of the Apple Peelers were left out. Collin Hitchcock and Paul Janzen were the members of this team.

Gordon Stallings
Contest Director

Slide Slips

Dear Editor:

Reference the review of C & H Video *Slide Show*, November 1982, page 78. The price of *The Slide Show* is $49.95, not $39.95 as listed. We feel that this still "represents a good buy" as you reported. While you were correct in pointing out the lack of a "picture-packing" routine, it was the size of the transitional effect routines and requests of our customers to concentrate on the speed of loading that brought this about. This being the case, the program has been written to allow for loading of a hi-res picture in 3-4 seconds.

Your review of the *Screen Director* points out the value of an "overlay" capability in presenting complex graphs and visuals in an additive format. We only wish that you had made the same observations about the *The Slide Show*, which includes *two* overlay effects. Both of these transitions allow the user to combine multiple pictures into a single image as you described.

Robert W. Hench, Jr.
C & H Video
110 W. Caracas Avenue
Hershey, PA 17033

Hi-Res Caveat

Dear Editor:

While the Article "Four High-Res Text Generators for the Apple—Comparative Review" by Andrew Berentes, in the July 1982 issue, was interesting, it did contain two items upon which I wish to comment.

First, the word of warning on page 44 regarding the memory range $300 to $3FF should also note that Apple DOS uses the range $3DO to $3EC and that the Apple Monitor uses the ranges $3FO to $3FF.

Second, the box on page 51 states that "...The Apple does not display control characters on the text screen..." While this is correct, page 151 of "The DOS Manual" (for DOS 3.3) and "Disk Operating System Instructional and Reference Manual" (for 3.2) gives a short machine language program which causes control characters (other than Carriage Return and Back Space) to be displayed as Flashing Characters on the text screen. The program given is shown in an Applesoft Program and connects to DOS. However, the same program can be used with Integer Basic (the changes are reasonably obvious).

Additionally, the program will work without DOS: remove the POKE 54,0; POKE 55,3 and insert them in the program where the display is desired, and remove the CALL 1002. This program is fully relocatable by changing the POKE 54,0 and POKE 55,3 which receive the low and high order bytes of the location of the program.

The following short assembly program displays all control characters (except CONTROL-M which is the carriage return) as Flashing Characters and all lower case characters as Inverse Characters:

```
         CMP   #$8D
         BEQ   COUT
         CMP   #$80
         BCC   COUT
         CMP   #$A0
         BCC   CTRL
         CMP   #$E0
         BCC   COUT
         AND   #$3F
         JMP   $FDF0
CTRL     AND   #$1F
         AND   #$1F
         ORA   #$40
COUT     JMP   $FDF0
```

The hexadecimal version of the above is

```
C9 8D F0 15 C9 80 90 11 C9 A0 90 09 C9 E0 90 09 29
3F 4C F0 FD 29 1F 09 40 4C F0 FD
```

This program can be used by loading it where desired and then inserting a POKE 54,LB and a POKE 55,HB where LB is the low order portion of the address at which the program is loaded, and HB is the high order of the address at which the program is loaded into the program. You may also do the foregoing POKEs in a short program which includes a CALL 1002 to connect to DOS.

Alan Westwell
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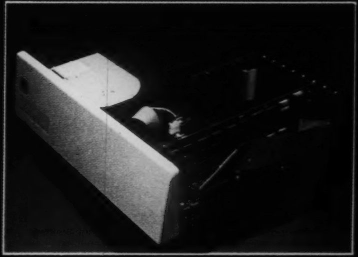

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Making New Thais

Dear Editor:

I am a career missionary living in Bangkok, Thailand. My husband and I own an Apple II computer which we use for a myriad of personal uses. Recently I have been exploring the possibility of using the Apple coupled with our Epson printer for word processing in Thai and several of the hilltribe languages. I would sincerely appreciate hearing from your readers who have had experience with alternate character set manipulation, foreign language programming, and graphic dumps to a printer.

I am interested in hints, software, books, articles, or corresponding with others who are interested in this type of application. This is new territory for me and I want and need to learn all that I can.

Sue Kavli
Box 832
Bangkok, Thailand

Creative Computing *has published several articles describing ways to create alternate character sets on the Apple. The most recent was "Cyrillic Anyone?" by Jeffrey Mangasarian in the July 1982 issue. We also recall that the winning entry in the personal computing applications contest at the 1980 NCC printed Thai characters with a Teletype printer. Do readers have more specific experience that may be of help?—EBS*

Respects Review

A copy of the following letter was sent to the editors.

Ms. Patricia D. Glenn
1599 Melrose Ave.
Columbus, OH 43224

I was very pleased to see your article, "It's Academic," about our *Mentor Master* and *Game Show* programs in *Creative Computing*.

I felt the article was an accurate and fair description of the programs. You may be interested to know that some of the shortcomings you mentioned have already been or are now being corrected. The problem with fill-in answers required only a minor change which was done immediately.

Also, since the article came out, we have added the ability to record student names and scores on the disk. While not done yet, I intend to add branching capabilities soon. The challenge here will not be devising the branching subroutine but rather finding room for it in an already packed program.

Thank you for your fine article and the obvious time and care you put into writing it.

Peter E. Holden
DataTech Software Systems
19312 East Eldorado Dr.
Aurora, CO 80013

Database Update

Dear Editor:

The following changes to Mark Pelczarski's Developing Data Base (Sept. '82) will make the program a bit more versatile:

```
105  DIM C$(7),C1%(7),C2%(7),F$(5
     ),C3$(7):CH = 0
5097  PRINT "<M> TO CONTINUE SEAR
     CH": PRINT "<E> TO END SEARC
     H": GET A$: IF A$ <  > "M" AND
     A$ <  > "E" THEN 5097
5098  IF A$ = "E" THEN RS = 1
8090  INPUT " ";C$(J): IF C2%(J) <
      > 2 GOTO 8092
8091  PRINT "SEARCH BY E) ENTRY (
     FAST)": PRINT  TAB( 11);"S)
     STRING (SLOW)": GET C3$(J): IF
     C3$(J) <  > "E" AND C3$(J) <
      > "S" THEN 8091
8092 J = J + 1: IF J > 7 THEN 816
     0
8292  IF C3$(J) = "S" THEN 8306
8306 L1 =  LEN (TI$(C1%(J))):L2 =
      LEN (C$(J))
8307  FOR J5 = 1 TO (L1 - L2 + 1)
     : IF  MID$ (TI$(C1%(J)),J5,L
     2) = C$(J) THEN 8330
8308  NEXT
8309  GOTO 8340
```

Lines 5097 and 5098 allow for the termination of the search routine when in the Change mode. Once you have found and corrected the record you want, you are no longer required to wait for the search to progress through the rest of the file.

The remaining lines are changes which allow the user to search for a substring within a specified field. This can be very helpful when you are not sure of the contents of the entire field. Or you could search for all items on your index of articles that were authored by Pelczarski—even if you don't happen to remember his first name. You can also put multiple keywords within one field.

My thanks to Mark Pelczarski for providing us with a powerful database program which we can enhance and tailor to our own needs.

Robert D. Steinberg
9030 Niles Center Rd.
Skokie, IL 60076

Bomber Bombing?

Dear Editor:

After typing the Valley Bomber program by Tim Basham (October 1982) into my TRS-80 Model III, I could not get it to run correctly.

I changed lines 5020, 5030, 5040 and made u = 1 in each of them instead of u = 0 and it ran fine.

Perhaps other readers of *Creative Computing* are having the same difficulty and can try this change.

Mark Phillips
25 Celestia Court
North Kingstown, RI 02852

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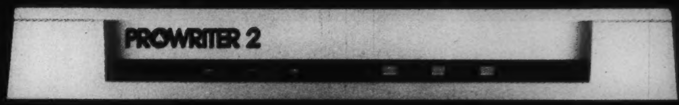

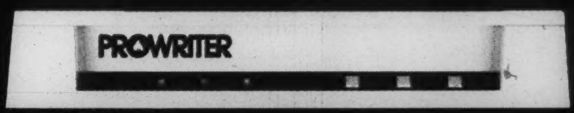

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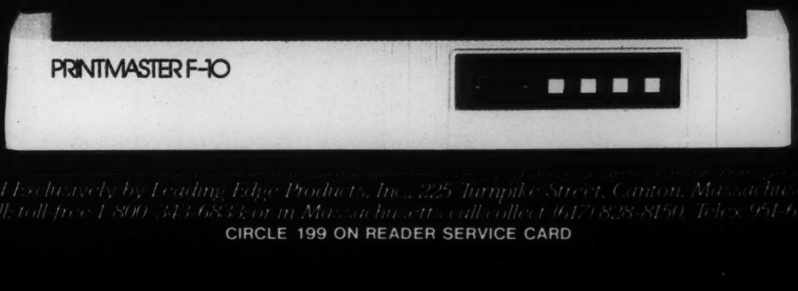

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National Computer Graphics Association

"Graphics at Work" in the "City That Works"—NCGA '83 sponsored by the National Computer Graphics Association, will be held in Chicago's McCormick Place, June 26-30, 1983.

New sessions added to the 1983 conference include shipbuilding CAD/CAM, engineering mapping and photogrammetry, printing and publishing, human factors, legal issues, and pattern recognition, and image processing.

Tutorial sessions are scheduled for June 26 and 27; technical sessions will run June 28-30; the exposition opens June 27 and continues through June 30.

For more information, contact NCGA '83, 8401 Arlington Blvd., Fairfax, VA 22031; (703) 698-9600.

Playing Our Hands

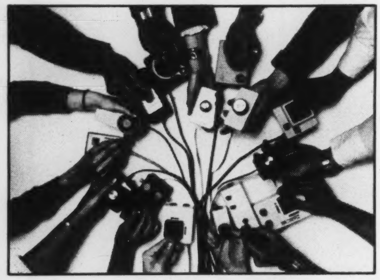
We knew it was hard, but we thought you were equal to the challenge. We didn't expect to be deluged with entries, but we expected more than six.

That's right, only six readers entered the Playing Our Hands Contest. You remember, the one in which we offered a one-year subscription to the first person to identify correctly the owners of the hands on our September 1982 cover.

It was a far cry from the over 300 entries we received in our trivia contest two years ago. Are you readers getting apathetic?

No one even wrote a program to generate all the possible combinations of hands and names.

All of the entrants correctly identified my hands—silver bracelet and ruffled cuffs — but it was straight downhill from there. One person even suggested that David and Sandy Small had flown in from Texas for the photo.



We have awarded the subscription to Eugene R. Hammond of Carmel-by-the-Sea, CA whose entry listed the most correct names.

To the other five sporting souls: Art Swanson of Cambridge, MA; Marc A. Shannon of Greenville, NC; Hung Hoang of Pacific Grove, CA; and David Vandergugten of Fort St. John, B.C. we have sent *Creative Computing* T-shirts.

And now to the correct answers: Starting at 12 o'clock and moving clockwise around the cover, you see the hands of Editor Betsy Staples (remember the ruffled cuffs?), Editorial Assistant Laura Gibbons (yes, she does have another arm, we just didn't need it), Managing Editor Peter Fee, Associate Editor John Anderson, Technical Editor Mike Coffey, former Editorial Assistant Karyn Hecht (she went back to college), Creative Computing Press Editor Claudette Moore, and the man with the plaid sleeves, Editorial Assistant Andy Brill.—*EBS*

National Computer Camp

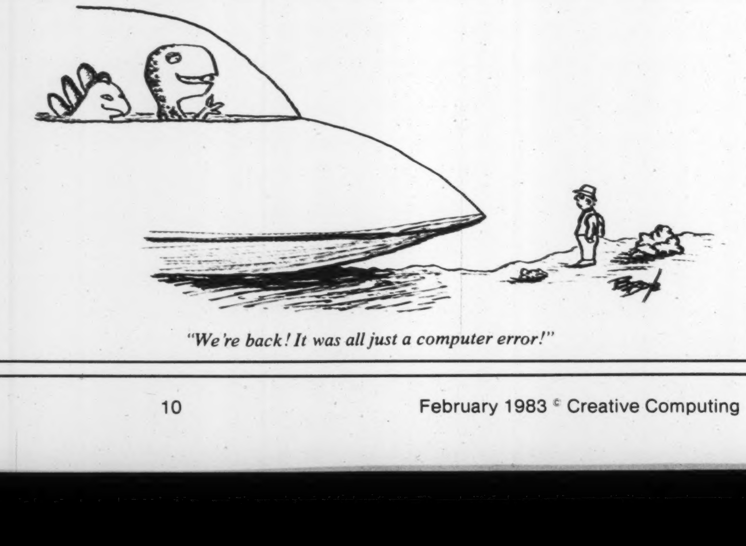
The Sixth Annual National Computer Camp will be held in Atlanta, GA and St. Louis, MO. The camps will be under the direction of Dr. Michael Zabinski, Professor at Fairfield University. One- and two-week sessions are available for campers ages 9-18 from July 3 to August 5.

For further information contact Michael Zabinski, Ph.D., at (203) 795-9667, or write National Computer Camp, P.O. Box 585, Orange, CT 06477.

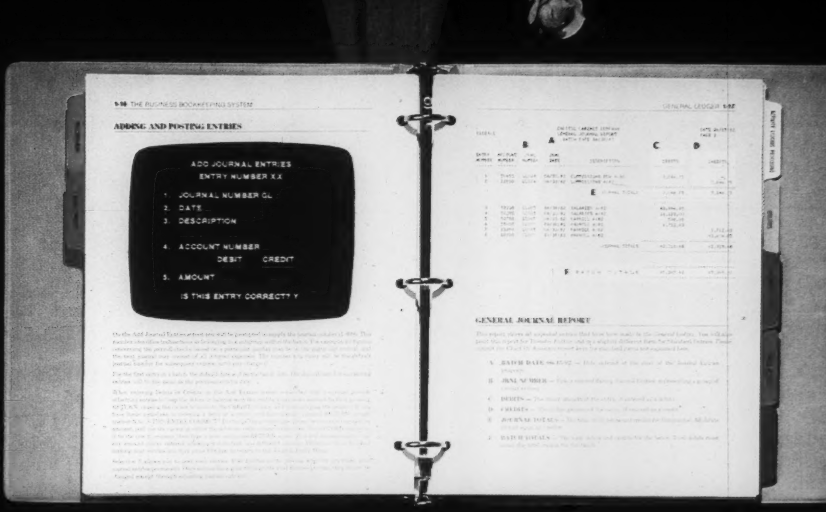
Corrections

"The Monkey and The Hunter," which appeared in our December, 1982 issue, was not printed in order. The correct page sequence should be: page 298, 304, 300, 302, 306, 308 and 310.

We have a correction for the address of Epson America, Inc., which appeared on page 104 of the *Creative Computing Buyer's Guide to Personal Computers, Peripherals and Electronic Games*. The correct address is: 3415 Kashiwa Ct., Torrance, CA 90505.



"We're back! It was all just a computer error!"



5-10 THE BUSINESS BOOKKEEPING SYSTEM

ADDING AND POSTING ENTRIES

```
        ADD JOURNAL ENTRIES
         ENTRY NUMBER XX

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2.  DATE
3.  DESCRIPTION

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              DEBIT     CREDIT

5.  AMOUNT

      IS THIS ENTRY CORRECT? Y
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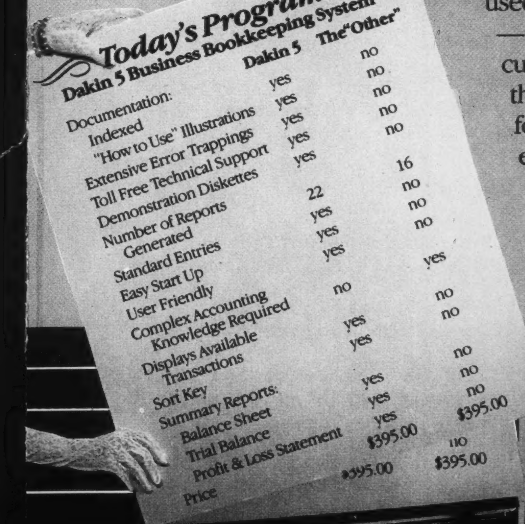

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Standard Entries	yes	no
Easy Start Up	yes	no
User Friendly	yes	no
Complex Accounting Knowledge Required	no	yes
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Sort Key	yes	no
Summary Reports:		
Balance Sheet	yes	no
Trial Balance	yes	no
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David H. Ahl

New Apples In The Orchard

We previously reported on two new Apples scheduled for release in 1983. However, it seems now that there will be three.

Lisa, the high-end unit, is based on the Motorola 16-bit 68000 chip. Modeled in the image of the Xerox Star, Lisa will be a professional workstation with high-resolution graphics and a Unix-type operating system. Price is expected to be $7000 plus.

One step down from Lisa is Mackintosh also based on the 68000. It also has excellent graphics including a graphics editor. Like the Osborne and many other recently-introduced business machines, Mackintosh will include a large assortment of software bundled into the package.

A third entry, The Apple Super II, is an updated Apple II Plus. Finally offering upper and lower case, the Super II also has cursor control keys and 64K of memory. Like the Timex/Sinclair ZX81, the Super II incorporates several custom very large scale integrated circuits that replace many of the chips used in the current Apple II. Rumor has it that the Super II has only 18 chips inside.

Because of the fewer chips and design which make it much more efficient to assemble, the Super II could potentially be priced quite low (under $1000). However, it will undoubtedly be the market that determines the price. The machine would be a good value priced the same as the existing Apple II, it would be a teriffic bargain at $1000, or if Apple decides to go to the mat with Atari and Commodore...well, who knows?

UNIX: Price Down, Sales Up, Users Fanatic

So you don't want a Unix-like operating system on the Apple Lisa; you want the real thing. Good news! AT&T dropped the royalty price of Unix from $5000 a few years ago to $750 and, just recently, slashed it to a bargain basement $100 per machine.

In addition, the latest version includes the most popular features from several earlier, independent Unix systems. Eight microcomputer manufacturers now offer Unix, including Radio Shack who previously has written its own proprietary packages.

Unix is an operating system that was written by Bell Labs back in the late 60's. It was licensed mainly to universities until micro makers started showing an interest in it in the last year or so. As a result, thousands of computer science students grew to know and love Unix.

Unix is a highly portable and accomodating system. As a result, software can be developed on one machine and easily transferred to another. Also, applications packages written on older computers can be updated to newer machines.

Now that Baby Bell, oops, American Bell is entering the free enterprise market one might expect that the world will see a great deal more of Unix, perhaps even on an AT&T desktop computer.

But don't hold your breath waiting for this computer. Right now American Bell is wrestling with more mundane problems like how to gracefully take over the Phone Center Stores. At this point, the stores don't even offer a modem, much less a computer.

Did the IBM PC Fall Into a Photocopier?

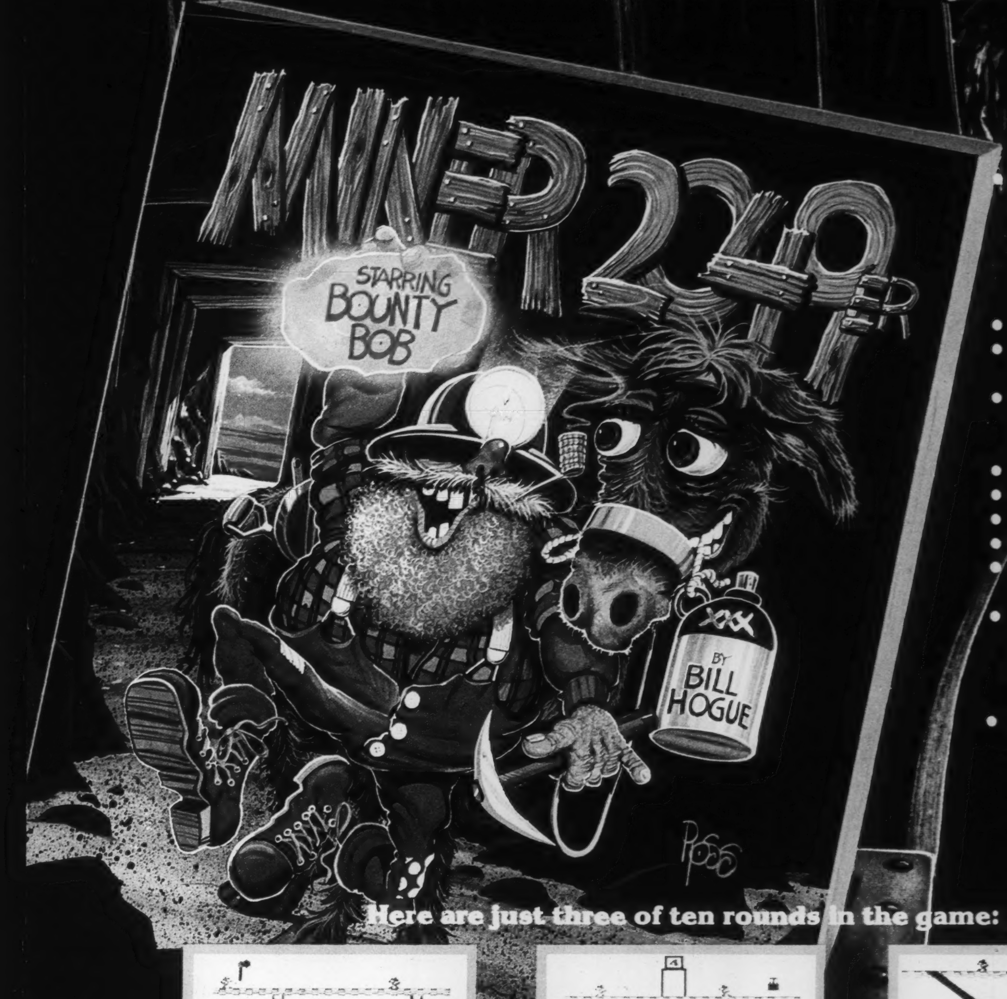
Over the last few months it seems as if every other announcement of a new computer says "IBM compatible." Some even try to look like an IBM PC, although most have a different physical appearance.

What does "IBM compatible" mean? In general it means a twin but not a clone. In other words, most programs designed for the PC will run on the twin with only minor modifications, but rarely with none at all.

Most of the twins try to go beyond the IBM design and offer something extra, such as greater portability or higher density disk storage. It almost goes without saying that most sell for 20 to 30% less than the IBM unit.

Six new Japanese computers, none of which have been introduced to the U.S. market yet, are IBM compatible. These include units from Sharp, Toshiba, Hitachi, NEC, Mitsubishi and Matsushita (Panasonic). More on these after winter CES.

Stake a Claim on the most exciting New Game for your Atari Home Computer.



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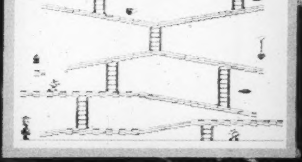
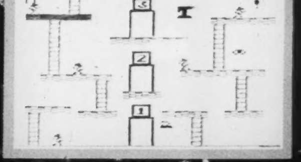
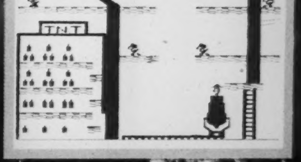
Here are just three of ten rounds in the game:



Round 1: The Mine Shaft.



Round 3: The Transporters.



Round 10: The Cannon.
Shoot yourself [illegible]

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Canon Introduces 8088-Based Personal Computer

Here's a curious turnabout. The IBM PC is based on the 16-bit Intel 8088 mpu. Three of the new Japanese IBM look-alikes do not use the 8088. The Canon AS-100 does use the 8088 but is not IBM compatible.

Some time ago in this column I mentioned that a landmark announcement at the 1982 NCC was that Microsoft and other American software companies had signed contracts to do software development for Japan, Inc. Here is an early result; the Canon AS-100 supports both MS-DOS and CP/M-86.

The AS-100 has 128K of RAM built in, expandable to 512K. Price of the basic computer is $1800 (monochrome) or $2700 (27 colors). A 5-1/4" 640KB floppy disk drive costs $1270 and a seven-color ink jet printer has a projected price of $770!

Video Games With Your Coke

New vending machines introduced by the Coca-Cola Co. feature a small-screen video game which nestles above the coin slot. By simply purchasing a Coke, the customer gets to play the game.

Two games are available. In one, a monkey hangs from a palm tree and tosses cans of Coke at the player-controlled delivery man below. Catch the Coke and the monkey pitches another can. If you miss the monkey laughs and the delivery man opens his mouth in surprise. Three misses and the game ends. If you've seen Activision's Kaboom, you get some idea of this game.

The object of the second game is to stop the correct letters in a moving line to spell the word Coke.

Most players put in hundreds of quarters before mastering a coin-op video game, but buying that many cans of Coke might give you pause, but not necesarily the pause that refreshes.

Video Games On Cable TV and Telephone

Some years ago, Warner established a two-way cable system, Qube, in Columbus, OH. Game designers were hired as consultants to dream up mass participation games that could be offered over the cable. But it never quite caught on because of the limited control available to each player.

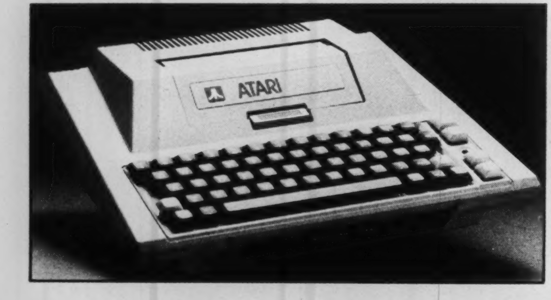
But now two companies think they have a better idea. PlayCable, a joint venture between Mattel and General Instruments offers games via cable that can be played with Mattel's Intellivision video game. Game Line, a similar system offered by Control Video Corp. of Washington allows owners of Atari video games to load games into their systems over the telephone.

Personal computer owners have been able to download games for some time now from both The Source and Compuserve. But perhaps the most popular and innovative game from a central service is Megawars offered by Compuserve. Differing from most others, Megawars is a multi-player game which accomodates from eight to ten players simultaneously. Currently, the game attracts about 2000 players per week at $5.00 per hour in the off hours.

Sega Arcade Game Uses Laser Videodisc

Sega, with some of the most innovative coin-op games around (Zaxxon, Turbo, Eliminator), has gone one step further to put realism into its games. The new machine combines a fast-moving video game with laser videodisc technology. The result is a game in which laser disc images (exploding tanks, moving monsters, etc.) interact with computer generated graphics.

Heightening the realism is a new sound system that utilizes what Sega calls "body-sonics" for a "total game experience never before encountered." PR hype? Maybe. But I'd advise setting aside a couple of quarters for when it comes to an arcade near you.



Atari 600 or ??

We don't usually run photos in Dateline:Tomorrow because we usually don't have any. However, since motoring magazines sometimes get their spies into proving grounds to get photos of next year's models, we thought we ought to be able to do it too. Well, it didn't happen quite like that, but anyway, here is a sneak preview of what may be the Atari 600. Kind of looks like a full-stroke keyboard dropped into a 400 case.

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Professional Software for the Hobbyist

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FORTH has been used for years by ATARI® and others in programming their arcade games. FORTH is fast: 15-20 times faster than BASIC, and can make use of every capability for your computer. And it's no longer the province of the professional programmer! With valFORTH and the additional packages described below, you can create programs in an afternoon that would previously have taken weeks of hard work!

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Then take advantage of our special offer on *Starting Forth* by Leo Brodie. Widely acclaimed as the best book available on the subject, this entertaining treatment of Forth will make you comfortable with this exciting language quickly and easily. When you order *Starting Forth*, you get a free copy of our "Notes for the valFORTH User," including references, by page, to *Starting Forth*.

These are the utilities developed by Valpar International's software specialists and used to create our commercial software products.

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NEW! By Popular Demand!

valDOS. Now you can use your valFORTH system to read and write normal Atari DOS Files created with valDOS or other sources. Also includes valDOS File Editor for creating and reading FORTH Source Code without "screens." (Not a general file editor.)

(Over 25 pages of documentation. Requires valFORTH.)

valFORTH T.M.

Package contains: fig-FORTH kernel with mathematical and stack operations machine-coded for higher speed than normal fig-FORTH; line editor AND screen editor, debugger, sound and graphics commands, floating point, advanced 6502 assembler, diskcopiers, and much more! (Over 110 pages of documentation)

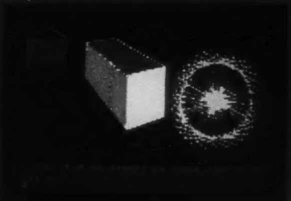
GENERAL UTILITIES AND VIDEO EDITOR

Utilities: 4 array types, 4 case types, text on graphics 8, extensive string manipulation and keyboard input, STICK & PADDLE, randoms, bit manipulation, and much, much more.

Editor: *fast, powerful, complete* valFORTH screen editor 1.1. A professional-quality tool that makes editing a pleasure.

(Over 60 pages of documentation. Requires valFORTH.)

PLAYER-MISSILE GRAPHICS, CHARACTER EDITOR, & SOUND EDITOR



Player-Missile: Create, move, color, change images of and bound players and missiles with high level commands. Full support of 5th player, multicolor players, etc. etc. All critical sections in machine code.

Character Editor: Compose character sets with joystick. Simultaneous display of created characters. Make images for players and missiles.

Sound Editor: Simple independent control of all four voices (one joystick per voice) and audio-control register. Create any single-setting sound with graphical and tabular readout.

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Principal Software Authors: Stephen Maguire and Evan Rosen

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All products are now on non-protected disks
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valFORTH	$45.00
General Utilities and Video Editor	40.00
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We make learning fun.
Learn computer programming concepts while creating your own colorful pictures.
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An introduction to the modern art of programming using the ancient art of drawing.

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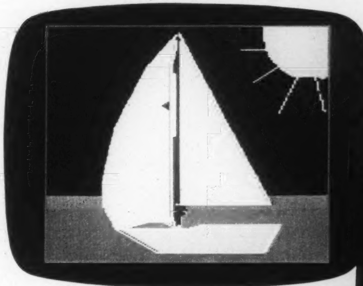
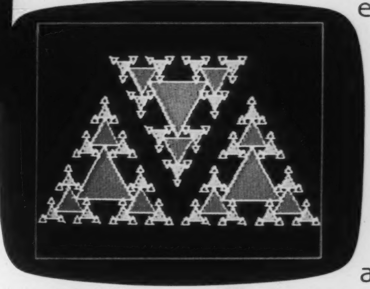
Kids love to draw.

And with Delta Drawing, your children can have fun creating their own colorful drawings, and at the same time, learn about computer programming.

Delta Drawing is much more than just a fun game. It's an educational tool that helps children develop their creativity, learn to write computer programs and build an understanding of procedural thinking.





Easier to use than LOGO.

Delta Drawing makes it easy for children to use the computer—even if they've never used a computer before.

In fact, it's easier to use than LOGO turtle graphics. And Delta Drawing costs less than half as much as LOGO.

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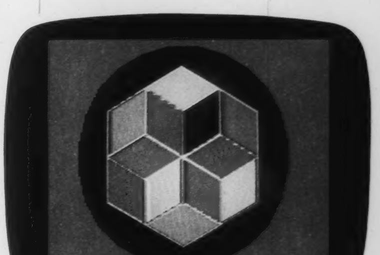
How your children will learn programming.

With Delta Drawing, your child first creates a picture using simple, single-key commands, for example: "D" for draw, "L" for left, "E" for erase.

As the picture is being drawn, the computer keeps track of every keystroke and records it as a program.

Then, by touching the "T" key for "text mode," the child can see the program that was written. As children progress, they can begin to write their programs in the text mode and switch to the graphics mode to see their pictures. They can even switch back and forth between graphics and text modes.



Delta Drawing will make your child comfortable with the computer and helps develop procedural thinking—the kind of step-by-step approach needed to write programs and solve problems with computers.

Get Delta Drawing today.

Delta Drawing can be played on Apple® computers.

It comes complete with easy-to-follow fast-start cards. And for more advanced users, a completely detailed instruction manual.

You can save your child's drawings on a blank disk and even print them, if you have a printer with graphics capabilities.

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You'll find that when we combined learning and fun, we created a work of art.

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Technical Analysis Tool For Investors

Dennis Costarakis

Investors and traders take note! Here is an easy to use technical analysis tool. The just released *Dow Jones Market Analyzer* by RTR Software, Inc. and Dow Jones & Company, Inc. is an easy to use, menu driven, technical analysis and charting program. (Charting refers to the graphing of securities prices. Technical analysis uses numerical analysis and/or graphic analysis of securities prices, price changes, and trading volume.)

At the outset, let me state that this program does not and will not tell you when to buy or sell securities. The *Dow Jones Market Analyzer* is a tool for the investor or trader to use in the analysis of securities price action, and in particular to improve the timing of purchases and sales of securities.

Technical analysis relies heavily on the recognition of certain securities price action or patterns as a means of determining when to buy and sell. There is a long standing controversy among investors and analysts as to the validity of technical analysis. Many of those who rely solely on fundamental data, i.e. the analysis of balance sheet data and sales and earnings projections, regard technical analysis as just so much witchcraft.

So many people rely on technical analysis, however, that to some degree at least, we probably invoke self-fulfilling prophecies. As an example, consider Bristol-Myers. Bristol-Myers stock could not get past a price of 42 for more than ten years until August of 1980. When the stock finally broke through the 42 level, previously considered a strong "resistance" level, many chartists and technical analysts recognized this as a significant event and rushed in to buy the stock. Bristol-Myers has not been below 42 since, and was at 73 in early November 1982.

The main problem an individual investor has with technical analysis is the amount of time and effort required to perform this analysis. This is where the *Dow Jones Market Analyzer* shines. It relieves the investor of the tedium and effort required to conduct the analysis. The program even has an automatic mode that enables you to pre-set any sequence of charting and analyses you desire for your stocks, thus saving you many keystrokes. A pause feature allows you to perform additional analysis during the auto run mode.

creative computing

SOFTWARE PROFILE

Name: Dow Jones Market Analyzer

Type: Securities Charting/Technical Analysis

System: 48K Apple, disk drive (two preferred), printer. To access Dow Jones News/Retrieval, Hayes Micromodem or Apple RS-232 card with acoustic coupler.

Format: Disk

Language: Machine language and Basic

Summary: A must for serious investors.

Price: $350

Manufacturer:

Dow Jones & Company, Inc.
P.O. Box 300
Princeton, NJ 98540
(609) 452-2000

The *Dow Jones Market Analyzer* comes in an attractive gray vinyl 8" x 9" loose leaf binder. Four disks are provided: a master, a backup, a data disk, and a temporary work disk. A one year warranty against defects is included. After one year, disks can be replaced for $30 each. There is a handy plastic reference card with the keystroke commands and page references. A menu map is also provided (Figure 1) that shows all the menus and how they are linked.

Purchase of the *Dow Jones Market Analyzer* includes a subscription to the Dow Jones News/Retrieval service and one hour of free time. The program can also be used by manually inputting all data. However, I can't believe anyone would manually input data once they see how efficiently and rapidly the auto dial, log on, retrieval of data, and phone hangup work.

Getting Started

The introduction to the manual is actually a teaser for the program and the information retrieval service. The next section, titled Getting Started, starts off by telling you how to get your free password and the Fact Finder (which contains local access phone numbers, stock and bond symbols, and information about the retrieval service). Commonly used terms are also defined here—a very thoughtful addition. Both the master and backup program disks are copy-protected, but must be used without a write protect tab.

After power up the first time, you are instructed to perform the system setup. This consists of storing the following information: number of disk drives, printer slot, modem type and slot, password, and stored telephone number(s) for Tymnet and Telenet.

A sample session follows that takes you step-by-step through a typical session, including setting up the data disk. I would recommend using three stocks initially. Three is enough to exercise the program sufficiently without using up too much computer time and your time as you learn the system. The sample session takes you through automatic data

---

Dennis A. Costarakis, 3562 Union St., San Diego, CA 92103

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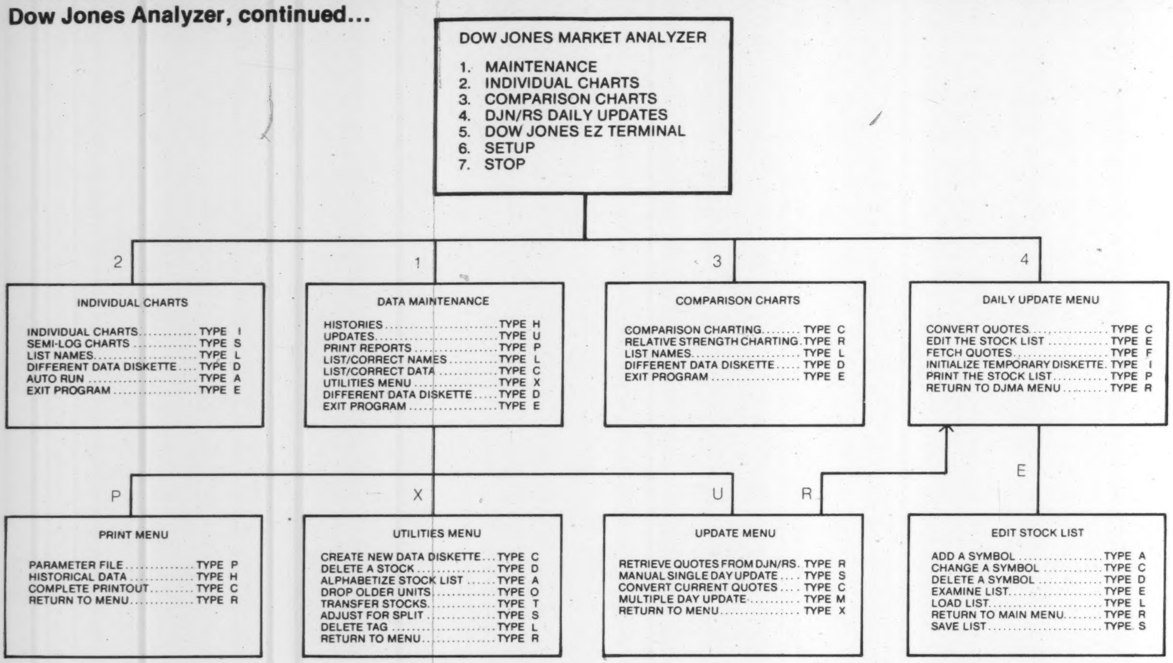
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2
1
3
4
INDIVIDUAL CHARTS
INDIVIDUAL CHARTS............TYPE I
SEMI-LOG CHARTS..............TYPE S
LIST NAMES...................TYPE L
DIFFERENT DATA DISKETTE......TYPE D
AUTO RUN.....................TYPE A
EXIT PROGRAM.................TYPE E
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HISTORIES....................TYPE H
UPDATES......................TYPE U
PRINT REPORTS................TYPE P
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COMPARISON CHARTING..........TYPE C
RELATIVE STRENGTH CHARTING.TYPE R
LIST NAMES...................TYPE L
DIFFERENT DATA DISKETTE......TYPE D
EXIT PROGRAM.................TYPE E
DAILY UPDATE MENU
CONVERT QUOTES...............TYPE C
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FETCH QUOTES.................TYPE F
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PRINT THE STOCK LIST.........TYPE P
RETURN TO DJMA MENU..........TYPE R
P
X
U
R
E
PRINT MENU
PARAMETER FILE...............TYPE P
HISTORICAL DATA..............TYPE H
COMPLETE PRINTOUT............TYPE C
RETURN TO MENU...............TYPE R
UTILITIES MENU
CREATE NEW DATA DISKETTE...TYPE C
DELETE A STOCK...............TYPE D
ALPHABETIZE STOCK LIST.......TYPE A
DROP OLDER UNITS.............TYPE O
TRANSFER STOCKS..............TYPE T
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RETURN TO MENU...............TYPE R
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MANUAL SINGLE DAY UPDATE.....TYPE S
CONVERT CURRENT QUOTES.......TYPE C
MULTIPLE DAY UPDATE..........TYPE M
RETURN TO MENU...............TYPE X
EDIT STOCK LIST
ADD A SYMBOL.................TYPE A
CHANGE A SYMBOL..............TYPE C
DELETE A SYMBOL..............TYPE D
EXAMINE LIST.................TYPE E
LOAD LIST....................TYPE L
RETURN TO MAIN MENU..........TYPE R
SAVE LIST....................TYPE S

Figure 1.

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retrieval as well as manual data entry.

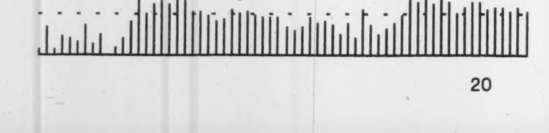
Two points must be noted at this time. 1) Believe it or not, the Dow Jones News/Retrieval service does not provide *any* market index information. That's right. You can't even get the Dow Jones Industrial averages; they must be stored manually if you want to use the information. 2) Error handling is not as I would have it. The manual points out that due to program space limitations only error message numbers are displayed when errors are detected. You must then look up the type of error in the manual. If that's not bad enough, and I can live with that, the screen is erased whenever an error is detected, erasing forever any and all work you may have had on the screen.

The first few times it happened, I uttered several epithets. There must be a better way, I thought. The saving grace is that once you get familiar with the program, and particularly when using the auto run feature, errors are not very likely to occur.

The program is menu driven, which makes it a joy to use. (I am partial to one keystroke menu driven programs.) The Data Maintenance Section allows you to place historical data on disk, updates the data disk with current quotes, prints hard copy of data information from disk, lists stock names and parameters on disks and allows for corrections, displays stock data on a disk and allows for corrections, creates a new data disk, deletes a stock, alphabetizes a stock list, drops outdated information, combines data from several disks, and adjusts for stock splits. It also has a feature for multiple-day quote updates which is ideal for use after a vacation when you need to update ten or twenty days' data.

We then come to the Individual Chart Section. The menu allows you to chart data for a stock on a standard bar chart with volume, charts bar charts on a semi-log scale chart, lists the symbols of the stocks from the disk in use, changes data disks, and constructs and saves a sequence of commands which can be automatically executed (Auto Run).

Figure 2.



Creating Charts

The heart of the *Market Analyzer* begins with the section titled Flashing Caret Mode. Once you have constructed your bar chart (Figure 2), you can begin to perform various forms of analysis such as simple moving averages, weighted moving averages, and exponential moving averages, and display and print the numerical version of the moving average. Figure 3 is the numerical table of a 12-day moving average, and Figure 4 is the 12-day moving average plotted on the bar chart.

All charts and tables were printed on an IDS 460-G printer with a Grappler printer interface. Straight lines, including horizontal lines, linear least-squares fit, trend lines, parallel lines, and speed resistance lines can also be plotted. Figure 5 is an example of a least squares fit. Scales can also be changed vertically, charts extended, and time periods changed. Oscillators and moving averages of oscillators can be plotted, too. You can also erase any line or moving average you have plotted—a very handy feature.

Figure 6 shows the bar chart for Digital Equipment Corporation and a 12-day exponential moving average plotted over it. At the bottom is an oscillator chart constructed by subtracting the

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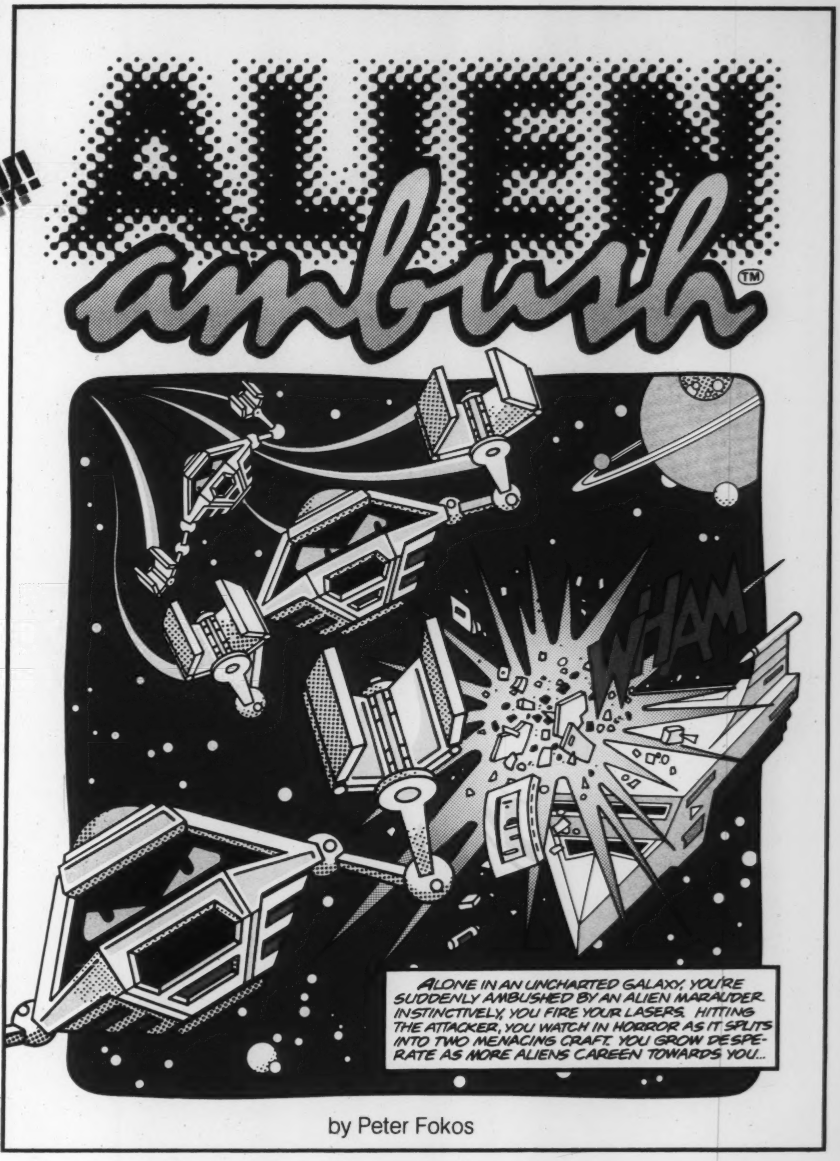
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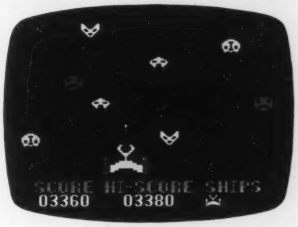
by Peter Fokos

You haven't lived until you've died in space.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And here's your chance.

Software author Peter Fokos has created Alien Ambush, a space age nightmare. It's a hi-res, full-color arcade game, fiendishly written to give those nasty aliens every advantage.

So if you have access to a 48K Apple* with DOS 3.3 or a 16K Atari 400/800** with a disk drive, and you're hot for some new thrills, Alien Ambush was written for you. But be warned: it just got a lot tougher to survive in space.

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8/19      26.25       24.14
8/20      29.88       25.18
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8/30      34.5        30.79
8/31      34.13       31.4
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9/7       37.38       33.83
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9/9       37.13       35.05
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9/14      37.63       35.96
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9/16      37.38       36.5
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9/20      36.13       36.39
9/21      37.63       36.62
9/22      35.88       36.48
9/23      36.88       36.55
9/24      37.13       36.66
9/27      37.13       36.74
9/28      36.25       36.65
9/29      35.38       36.42
9/30      34.88       36.14
10/1      35.25       35.98
10/4      35.25       35.84
10/5      35.88       35.85
10/6      39.5        36.51
10/7      40.88       37.31
10/8      43.5        38.43
10/11     46.88       39.97
10/12     47          41.24
10/13     48.13       42.5
10/14     46.75       43.27
10/15     47.63       44.06
10/18     50.25       45.18
10/19     50.88       46.22
10/20     54          47.63
10/21     54          48.79
10/22     53.38       49.62
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Figure 3.

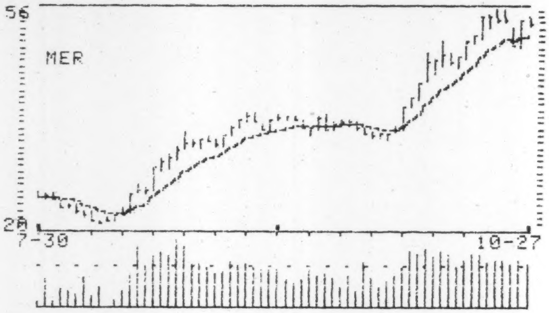

Figure 4.

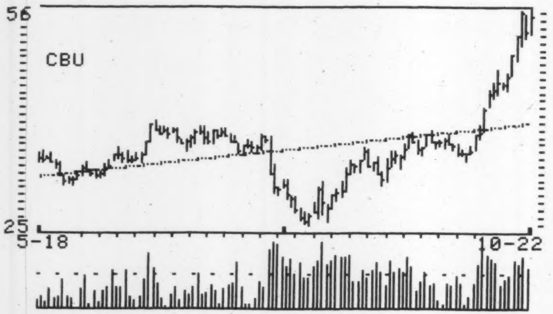

Figure 5.

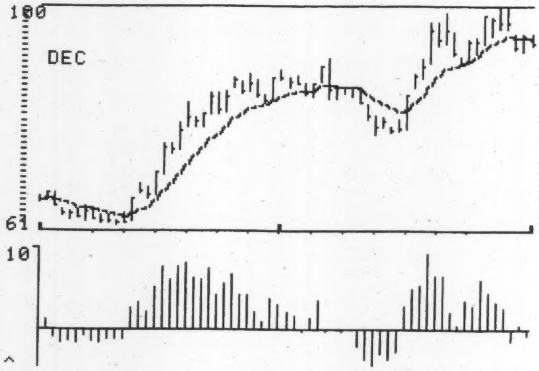

Figure 6.

value of the 12-day exponential moving averages from the daily closing price of the stock. Figure 7 shows how several plots can be combined. A 5-day and 12-day exponential moving average is plotted over the bar chart of Digital Equipment Corporation. The oscillator represents the difference between the 5-day and 12-day exponential moving average. The theory is to buy when the oscillator goes from under to over the horizontal line, and to sell when the oscillator goes below the horizontal. This type of analysis works relatively well during strong market movements up or down such as we experienced in the second half of 1982.

This technique causes excess trading when a stock moves sideways and will result in losses during such movement. When using technical analysis, provision must be made to eliminate or avoid sideways moving markets.

Figure 8 shows a chart with a 12-day exponential moving average and an indicator chart below. The indicator is a cumulative volume indicator with a 12-day simple moving average of the indicator plotted on it. Figure 9 shows a semi-log chart of Digital Equipment with a trendline plotted.

In addition to the cumulative volume indicator shown on Figure 8, the program can also plot negative and positive volume indicators, volume line chart, price volume trend, and daily volume indicators. You can also furnish your own indicator by using the User Jump Rou-

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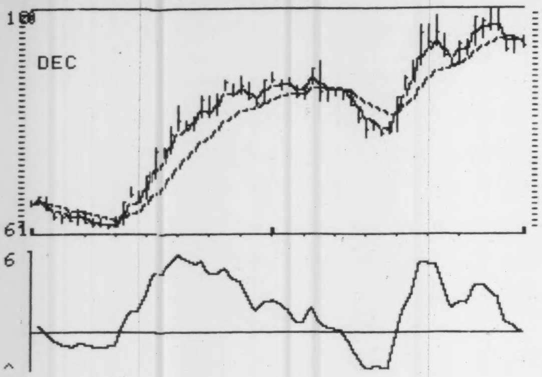

Figure 7.

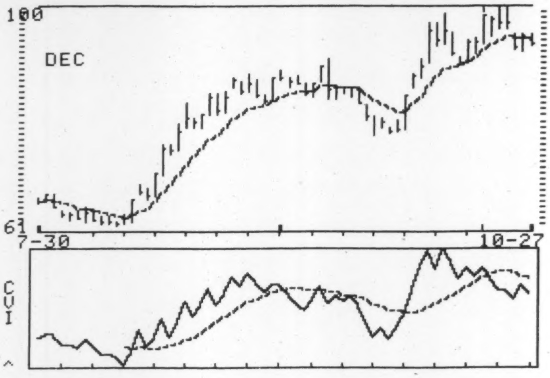

Figure 8.

tine. You can actually provide your own subroutine to be plotted. The User Jump Routine is also used to enable your printer to plot the charts shown here, providing your printer is capable of graphics.

If you plan to print many charts, I recommend you obtain a printer buffer to store the chart while it is being printed so you can use the computer while the printer is printing the charts. Most printers take several minutes to print these charts. Several User Jump Routines are provided in the manual for the Silentype, Trendcom 200 and for any printer using a Grappler interface. With an IDS printer I recommend you change line 31000 to read:

```
31000 PRINT: VTAB 23: INPUT
      ''LARGE OR SMALL''; U$
```

The manual does not have the PRINT statement in line 31000. Without it, the input query spans two lines. With it, it is all on line 23 on the screen.

The program also allows for comparison charting. If you have a color monitor, you can plot two to five stocks relative to a $100 purchase in each stock at the same time. Figure 10 shows how MER performed relative to DEC when $100 was invested in each on 7-30-82. Relative strength charts can be plotted also.

Any chart plotted on the screen can be saved to disk for later plotting. This is useful for those who use software to drive their printers in the graphics mode.

An added feature of the program is the Dow Jones E Z Terminal mode which allows you to retrieve news information and other data from the Dow Jones News/Retrieval service. This very nice feature allows you to keep up with news and earnings reports about companies in which you have an interest.

Brief discussions and examples of the various principles and techniques used in the program are also provided. These are necessarily brief discussions (The whole manual is 101 pages including the index) and should be used only as an introduction to each of the technical analysis methods mentioned. A suggested reading list is also provided (12 books). Most, if not all, should be available at larger libraries. Most are still in print.

Caveats

If you plan to use this program and manually input data, buy a key pad, you'll need it.

Remember that the Dow Jones database does not adjust for stock splits. If you see a large gap or hole in the chart, check to see if there was a split.

On comparison charts, the legend is not completely printed. You will have to make a note as to which plot is which stock. You will also need a color monitor if you plan to compare more than two or three stocks.

Error messages cause you to lose all plots on the screen. I found I needed to keep notes on what I was doing. There is one quirk. The temporary work disk has to be put into drive 1. If you accidentally put it into drive 2, you'll get an error message and lose your work on the screen. It got me several times. The data disks go into drive 2. Only the temporary work disk goes into drive 1. Don't ask me why. Just be careful.

All in all, the *Dow Jones Market Analyzer* is a powerful and useful program for any investor who wants to improve the timing of his purchases and sales. I have not come across a program with these capabilities at this price. Most are more expensive. Serious investors should definitely have a plotting/technical analysis program to assist in their analysis of stocks. The *Dow Jones Market Analyzer* certainly fills the bill. ☐

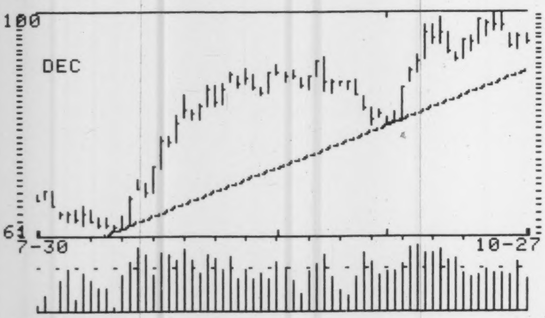

Figure 9.

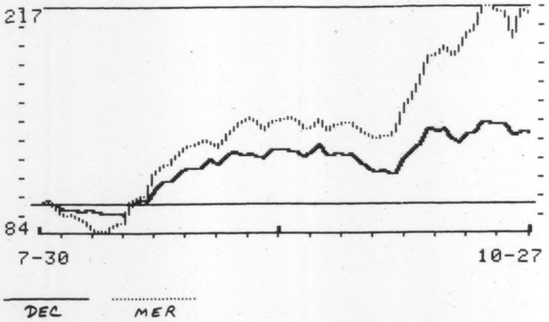

Figure 10.

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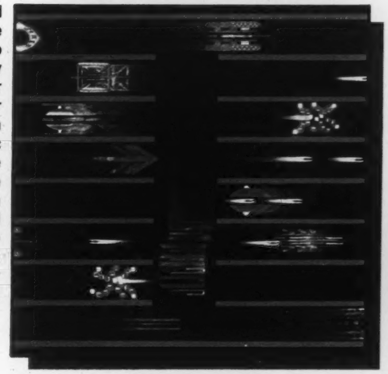

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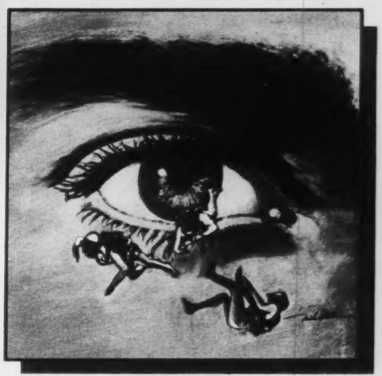

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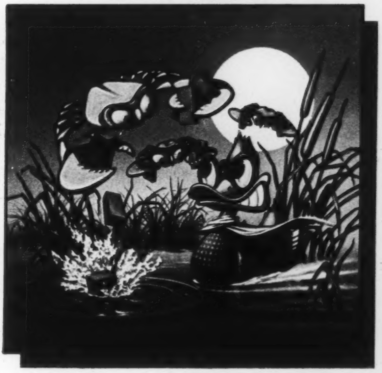
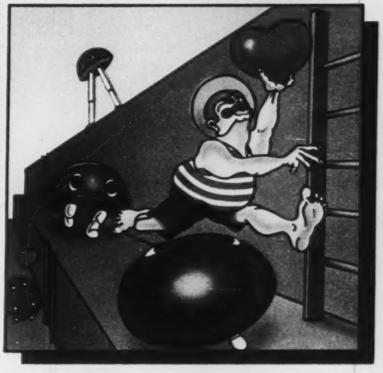


Those cranky crabs are trying to drive the ducks from their once quiet pond. Imagine, crabs taking to the air armed with bricks and bombs! Luckily, Deadly Duck has a few tricks of his own. His gun barrel bill can unleash a bevy of crab cracking bullets at a moment's notice. Look out, Deadly, here comes another brick! It takes more than luck to play Deadly Duck.

Fast Eddie™



You've got to be cool and you've got to be steady to play Fast Eddie. Eddie is on a wild treasure hunt, climbing up and down ladders everywhere in search of prizes. Things would sure be a lot easier if it weren't for all of those pesky little Sneakers™ running around. They literally keep him jumping!

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Stock Options Analysis Program

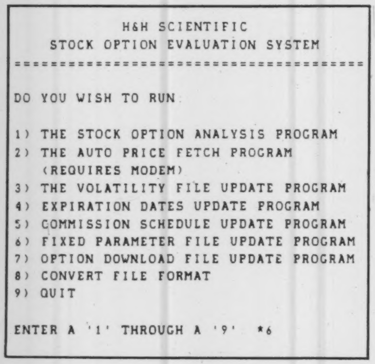
Soft SOAP

Dennis A. Costarakis

Time is money. The *Stock Option Analysis Program* will help you save, and make, both time and money. The bane of any serious investor is the amount of time and effort it takes to analyze and evaluate all but the simplest of investments or the most basic of strategies, especially when options on stocks are involved. The *Stock Option Analysis Program* (SOAP) eliminates these drawbacks and provides the investor with a tool with which to evaluate virtually all types of option strategies.

The manual that comes with *SOAP* "assumes that the user has a basic understanding of the options markets and options strategies." However, some definitions are in order before proceeding further.

Figure 1.



```
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======================================

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1) THE STOCK OPTION ANALYSIS PROGRAM
2) THE AUTO PRICE FETCH PROGRAM
   (REQUIRES MODEM)
3) THE VOLATILITY FILE UPDATE PROGRAM
4) EXPIRATION DATES UPDATE PROGRAM
5) COMMISSION SCHEDULE UPDATE PROGRAM
6) FIXED PARAMETER FILE UPDATE PROGRAM
7) OPTION DOWNLOAD FILE UPDATE PROGRAM
8) CONVERT FILE FORMAT
9) QUIT

ENTER A '1' THROUGH A '9'  *6
```

An option is a security that allows the owner of the option to buy (call) or sell (put) 100 shares of stock at a specific price for a specified period of time. With the advent of the listed options markets, options were standardized with respect to exercise price and expiration dates.

Standardizing options provided the investor with the means to buy and sell options as easily as buying and selling stocks. As of June 24, 1982, there were 331 stocks that had options trading on the four listed option exchanges. All options trading and rules are governed by the Options Clearing Corporation (OCC).

The OCC is also the organization that issues "The Options Clearing Corporation Prospectus," a pamphlet that must be given to all investors prior to making their first option transaction. It is the most readable and understandable prospectus you will ever read. It covers all the rules and regulations for all four options exchanges, and details all the risks involved with option trading.

In addition to the prospectus, your broker can provide you with explanatory booklets describing put and call options and various strategies. The booklets can also be obtained directly from the exchanges that publish them (address can be found in the prospectus).

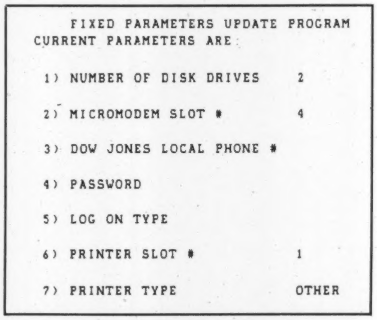
creative computing
SOFTWARE PROFILE

Name: Stock Option Analysis Program
Type: Investment analysis (listed options)
System: 48K Apple II with Applesoft in ROM, or II+; Optional: D.C. Hayes Micromodem, Printer, and access to Dow Jones News/Retrieval system
Format: Disk (copy protected)
Language: Basic
Summary: Comprehensive and valuable option analysis package
Price: $250.00
Manufacturer:
H & H Scientific
13507 Pendleton St.
Fort Washington, MD 20744
(301) 292-3100

Back to the program. The *Stock Option Analysis Program* comes with two disks, the program disk (copy protected) and the data disk. A backup program disk can be purchased for $25. Personally, I object to having to pay for a backup, particularly when a program costs over $100.

After backing up the data disk and write-protecting the program disk, as I usually do when I first get a new disk, I began reading the program manual. Once past the introduction and into the program instructions, I realized that I could not keep the program disk write protected, as the program stores some updated files on the master program disk.

Figure 2.



```
       FIXED PARAMETERS UPDATE PROGRAM
    CURRENT PARAMETERS ARE:

     1) NUMBER OF DISK DRIVES     2

     2) MICROMODEM SLOT #         4

     3) DOW JONES LOCAL PHONE #

     4) PASSWORD

     5) LOG ON TYPE

     6) PRINTER SLOT #            1

     7) PRINTER TYPE              OTHER
```

This feature forces you to use the only program disk that comes in the package. Although I had no problems, it always makes me nervous when I have to use my one and only disk day in and day out. Murphy's Law is bound to catch up sooner or later.

Getting Started

The first part of *SOAP* you encounter is the main menu (Figure 1), and the first item you go through is the Fixed Parameter File Update Program (Figure 2). The manual very thoroughly guides you through this section. Setting and saving the fixed parameters stores your system configuration in a file that is que-

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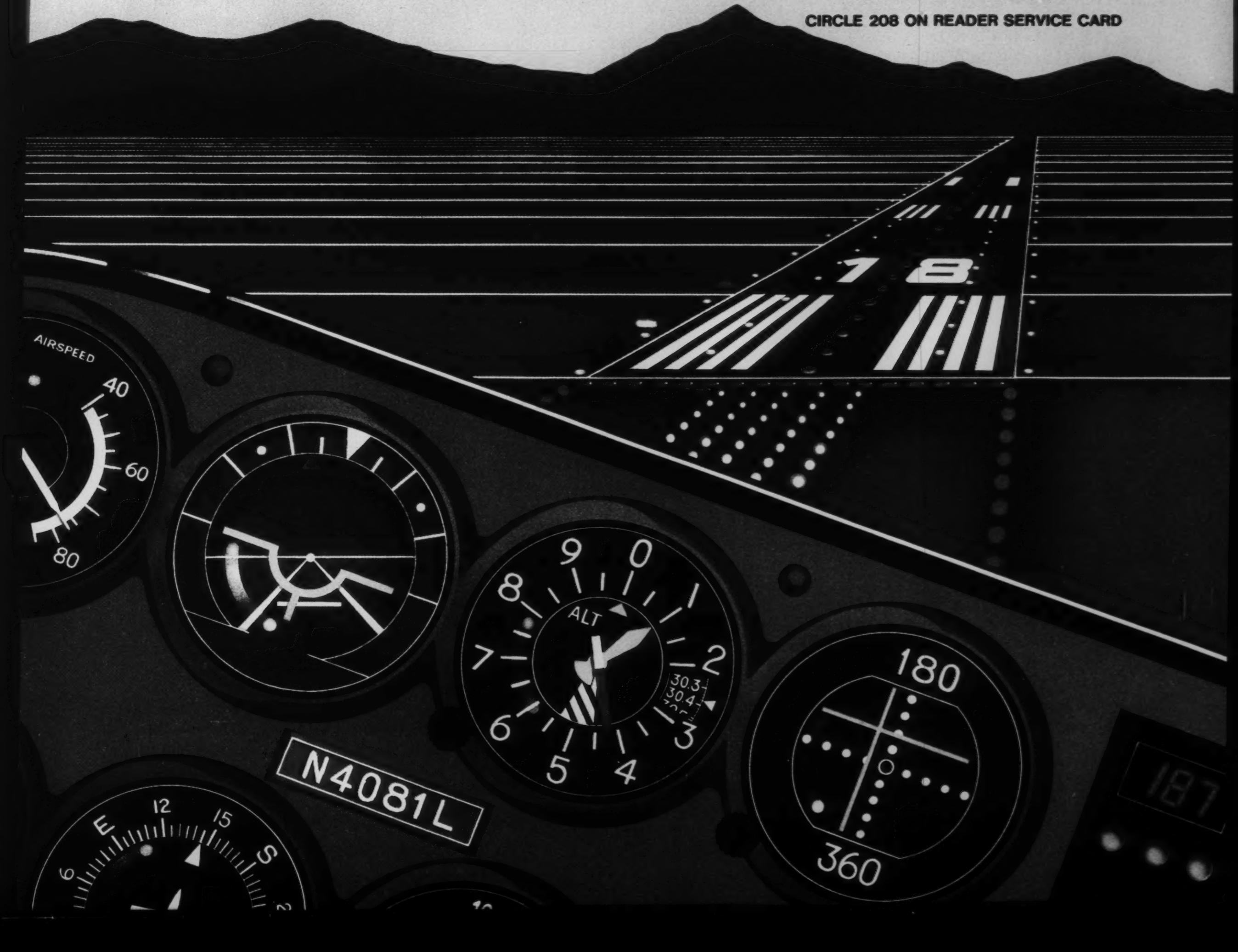


ried on system startup, eliminating the need to enter the data each time the system is used.

The *Stock Option Analysis Program* can be run without using any of the other programs on the disk. All required input can be entered via the keyboard. The great strength of this package, however, is the automatic data retrieval capability using the Dow Jones News/Retrieval database.

Access to this database service is available by a local telephone call in most U.S. and Canadian cities through the Tymnet and Telenet timesharing services. The Dow Jones News/Retrieval service must be purchased separately from Dow Jones & Co.

The operating guide that comes with the database service lists all the Tymnet and Telenet local telephone numbers for the U.S. and Canada, log on procedures (for manual use of the database), symbols, and procedures to access desired data and information. The stock symbols found in the News/Retrieval Operating guide are used to create automatic data retrieval files when using the "auto price fetch" and "option download file" programs (Figure 1) in the *SOAP.*

After you have set up the fixed parameters, it is a good idea to read the manual a couple of times to familiarize yourself with it. Then go through the Sample Case shown in Appendix A. I found that the Sample Case clarified several points that were not explained clearly in the manual. Stepping through the Sample Case will also familiarize you with the program before you attempt to use it with your own files or stocks.

Considering the power of this program, it is relatively easy to use. One nice feature is the availability of two types of cursor—a flashing asterisk which indicates that only a one-key response is necessary and the regular flashing square which indicates that a multiple-key input followed by a return is required.

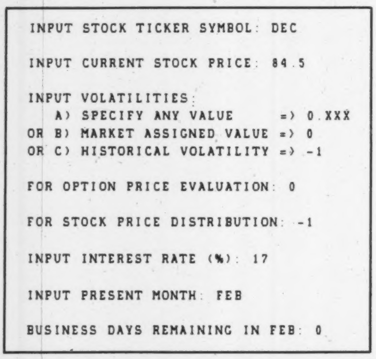
Error trapping is very good, but not excellent. At one point, I did manage to break out of the program with some effort. Also, the program is not thoroughly trapped to catch null inputs where they don't belong (return key input only). Successive presses of the return key at some points in the program result in an error message referring you to the DOS manual and return you to the main menu. Under normal use, however, the program works just fine. I have used it for several hundred complete analyses with no problems.

I do feel that error trapping should be complete and thorough, and should withstand any test. A means for retreating to the previous input to make a correction during data input should be provided in all programs (say, in the event the return key was pressed accidentally with no input). It is not available in the *SOAP.*

It is also nice to have the escape or a control key allow the user to return to the main menu or last used menu at any time during input to facilitate exiting any section of any program. This also is not available in the *SOAP.* You must either force an error message or complete the data input for the analysis.

The *Stock Option Analysis Program* has two great strengths. One, mentioned earlier, is the ability to retrieve stock and option price data automatically from a database using a modem, thereby saving untold hours of manual price updating. The second is the main purpose of the program, the analysis of option strategies.

Figure 3.



```
INPUT STOCK TICKER SYMBOL: DEC

INPUT CURRENT STOCK PRICE: 84.5

INPUT VOLATILITIES:
   A) SPECIFY ANY VALUE      =) 0.XXX
OR B) MARKET ASSIGNED VALUE =) 0
OR C) HISTORICAL VOLATILITY =) -1

FOR OPTION PRICE EVALUATION: 0

FOR STOCK PRICE DISTRIBUTION: -1

INPUT INTEREST RATE (%): 17

INPUT PRESENT MONTH: FEB

BUSINESS DAYS REMAINING IN FEB: 0
```

Unless you are interested in only one or two stocks, it is virtually impossible to evaluate option strategies effectively without a computer and a program like *SOAP.* The heart of any analysis program is its ability to predict (prices) accurately. Option prices are a function of both the stock price and the amount of time left before the option expires.

SOAP uses the Black and Scholes option pricing mathematical model that professors Fischer Black and Myron Scholes first published in 1973. To be honest, I have always doubted the value and usefulness of pricing models. *SOAP* has proven to me the value of this model as used in the program.

I went through six months of back issues of the Daily Graphs *Stock Option Guide,* a weekly publication of charts and statistical data on all listed options and the underlying common stock, starting with December 1981, to check the accuracy of *SOAP*'s calculations. I compared the stock volatilities as determined by *SOAP* with those listed in the *Stock Option Guide.* They were either very close or in the ballpark.

More important, when predicting the price of an option for a specific stock price, the program demonstrates its usefulness time and again. It calculates for a range of stock prices what the predicted option price will be for the day requested, and what the net profit/loss will be at those prices for the strategy used. This not only allows you to project and evaluate strategies, it enables you to manage your portfolio positions more effectively.

Using The Program

Update the stock and option daily price files before using the main program to speed up the analysis. The first thing the program does is read the Fixed Parameters File. It then advises you to insert the data disk in the appropriate drive. At this point you are asked to indicate which commission schedule you wish to use, the old pre-1976 New York Stock Exchange standard commission schedule, a typical discount broker's schedule, or a typical standard broker's schedule. You can add your own broker's schedule if you like.

After accepting the commission schedule, the program searches for a daily file which you may have created previously. It then displays on the monitor all the stock symbols in the daily file, if one exists. The program will then ask you if you want to use the file.

Using the file enables the computer to use price and dividend information automatically, saving you the trouble of entering them manually. Next, you are asked to enter the ticker symbol of the stock you wish to analyze (Figure 3). The stock price is then either manually entered or automatically retrieved from the daily file.

You are then asked to input two volatility figures, and are given the alternatives of specifying the number, using either a market assigned value or a volatility derived from historical data. I normally use the market assigned value for the option price evaluation, and historical volatility for the stock price distribution.

Volatility is the probable percent price change of a stock in one year. The program gives you the opportunity to enter your own estimate at this point, a very valuable feature if you like to play "what if?"

The next data input is the interest rate that could be obtained if the funds were invested in short term notes rather than options.

The current data are entered in a rather different manner. The month and number of business days remaining in the month are the necessary input.

At this point in the program you are asked for the type of strategy you wish

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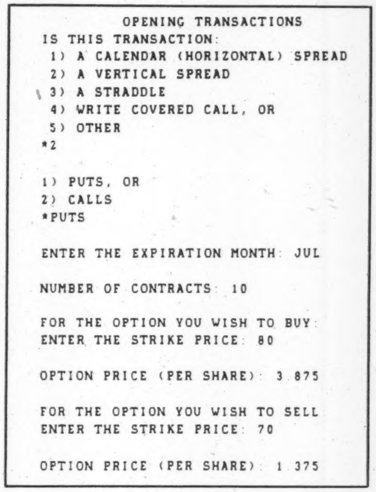
to employ, and you then request the specific information for that strategy (Figure 4). In this case, a bearish spread was chosen (i.e., different exercise for the same expiration month).

Figure 4.



```
              OPENING TRANSACTIONS
  IS THIS TRANSACTION:
   1) A CALENDAR (HORIZONTAL) SPREAD
   2) A VERTICAL SPREAD
   3) A STRADDLE
   4) WRITE COVERED CALL, OR
   5) OTHER
  *2

  1) PUTS, OR
  2) CALLS
  *PUTS

  ENTER THE EXPIRATION MONTH: JUL

  NUMBER OF CONTRACTS: 10

  FOR THE OPTION YOU WISH TO BUY:
  ENTER THE STRIKE PRICE: 80

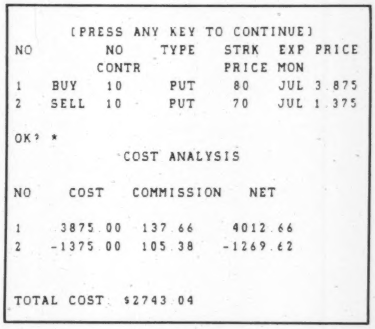
  OPTION PRICE (PER SHARE): 3.875

  FOR THE OPTION YOU WISH TO SELL
  ENTER THE STRIKE PRICE: 70

  OPTION PRICE (PER SHARE): 1.375
```

Once the data have been entered you are given an opportunity to change any of the input data (they are displayed in condensed format in the top half of Figure 5).

Figure 5.



```
       [PRESS ANY KEY TO CONTINUE]
NO        NO    TYPE    STRK  EXP PRICE
        CONTR           PRICE MON
1   BUY   10     PUT     80    JUL 3.875
2   SELL  10     PUT     70    JUL 1.375

OK? *
             COST ANALYSIS

NO     COST    COMMISSION    NET

1     3875.00  137.66     4012.66
2    -1375.00  105.38    -1269.62

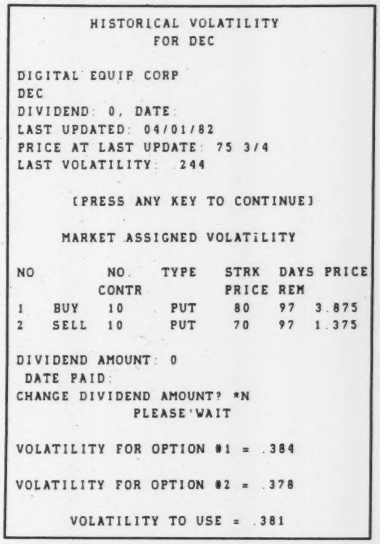

TOTAL COST: $2743.04
```

SOAP now retrieves and/or calculates the stock and option volatilities, displays them, and requests an average volatility to use for the option spread in this case (Figure 6). This volatility input is significant, as it is the key number used to calculate the estimated future option prices. I noticed that the farther apart the two option volatilities were from each other, say .2 or more, the greater was the variability in the predicted price compared to the actual price of the option. This is something to keep in mind when using the program.

Next, you are given another opportunity to change any of the previously input data (Figure 7). This is also the input screen used to enter new data for additional calculations when the current strategy has been evaluated—another time saving device. Once you are satisfied with the data, you can obtain the predicted price distribution. *SOAP* calculates the number of days remaining for each option and asks for the number of days in the future that you want the calculations (Figure 8).

It is this feature that enables you to create an entire sequence of calculations from the present data all the way out to the nearest option expiration date. By producing calculations on a weekly, biweekly, or monthly basis for each strategy you employ, you can actively track and manage each of your option strategies as necessary.

Figure 6.



```
         HISTORICAL VOLATILITY
                FOR DEC

DIGITAL EQUIP CORP
DEC
DIVIDEND: 0, DATE:
LAST UPDATED: 04/01/82
PRICE AT LAST UPDATE: 75 3/4
LAST VOLATILITY: .244

       [PRESS ANY KEY TO CONTINUE]

     MARKET ASSIGNED VOLATILITY

NO         NO.   TYPE    STRK  DAYS PRICE
         CONTR           PRICE REM
1   BUY   10      PUT     80    97   3.875
2   SELL  10      PUT     70    97   1.375

DIVIDEND AMOUNT: 0
 DATE PAID:
CHANGE DIVIDEND AMOUNT? *N
             PLEASE'WAIT

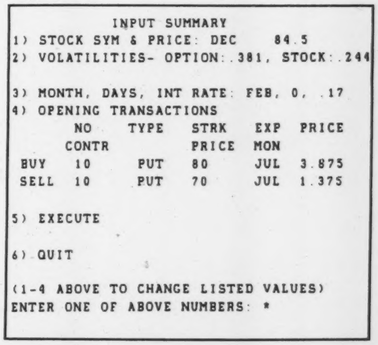
VOLATILITY FOR OPTION #1 = .384

VOLATILITY FOR OPTION #2 = .378

      VOLATILITY TO USE = .381
```

The statistical and graphic printouts also vividly demsonstrate the effect of time on the value of the options and the strategy when a sequence of printouts over time are compared. The statistical printout for the case we have been using is shown in Figure 9.

Figure 7.



```
            INPUT SUMMARY
1) STOCK SYM & PRICE: DEC     84.5
2) VOLATILITIES- OPTION:.381, STOCK:.244

3) MONTH, DAYS, INT RATE: FEB, 0, .17
4) OPENING TRANSACTIONS
      NO    TYPE    STRK    EXP   PRICE
     CONTR          PRICE   MON
 BUY   10     PUT    80      JUL   3.875
 SELL  10     PUT    70      JUL   1.375

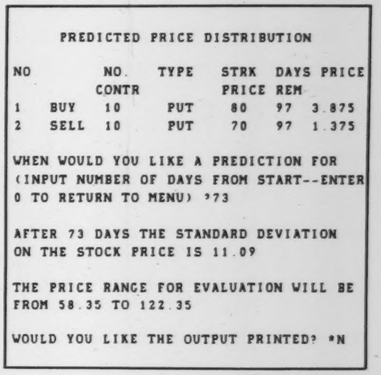

5) EXECUTE


6) QUIT


(1-4 ABOVE TO CHANGE LISTED VALUES)
ENTER ONE OF ABOVE NUMBERS: *
```

The expected loss estimate was the one consistent annoyance I experienced with the program. It rarely ever came close to actual results. The author uses mathematical probability to determine this estimate. If predicting stock prices were that easy, we would all be rich. My best advice is to ignore this estimate.

Figure 8.



```
     PREDICTED PRICE DISTRIBUTION

NO         NO.   TYPE    STRK  DAYS PRICE
         CONTR           PRICE REM
1   BUY   10      PUT     80    97   3.875
2   SELL  10      PUT     70    97   1.375

WHEN WOULD YOU LIKE A PREDICTION FOR
(INPUT NUMBER OF DAYS FROM START--ENTER
0 TO RETURN TO MENU) ?73

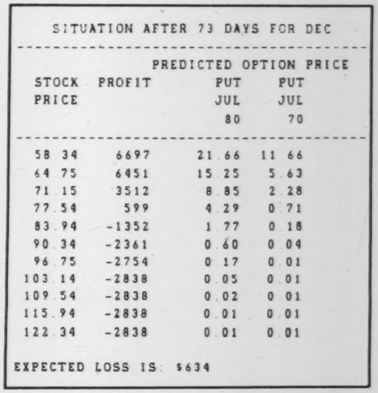
AFTER 73 DAYS THE STANDARD DEVIATION
ON THE STOCK PRICE IS 11.09

THE PRICE RANGE FOR EVALUATION WILL BE
FROM 58.35 TO 122.35

WOULD YOU LIKE THE OUTPUT PRINTED? *N
```

I don't have a hi-res graphics interface for my printer yet, so I cannot produce hard copy graphics. Figure 10 is a copy of the chart that comes with the *SOAP* manual. Figure 10 gives you an idea of the capability of the program. *SOAP* is supposed to work with any of the currently available printer interfaces that include hi-res graphics screen dump routines in firmware. You also have the option of saving the graphics screen to disk for later printout if you have a software dump routine you can use.

Figure 9.



```
   SITUATION AFTER 73 DAYS FOR DEC
-----------------------------------------
                PREDICTED OPTION PRICE
  STOCK  PROFIT         PUT     PUT
  PRICE                 JUL     JUL
                         80      70
-----------------------------------------
  58.34    6697       21.66   11.66
  64.75    6451       15.25    5.63
  71.15    3512        8.85    2.28
  77.54     599        4.29    0.71
  83.94   -1352        1.77    0.18
  90.34   -2361        0.60    0.04
  96.75   -2754        0.17    0.01
 103.14   -2838        0.05    0.01
 109.54   -2838        0.02    0.01
 115.94   -2838        0.01    0.01
 122.34   -2838        0.01    0.01

EXPECTED LOSS IS: $634
```

It is not difficult to become familiar with the *Stock Option Analysis Program.* In fact, after three or four trial runs I felt right at home with the program. The two most tedious procedures are the creation of the stock and option files for use

Stock Options, continued...

with the automatic price retrieval system and verifying the accuracy of the expiration dates file that comes with the program.

Murphy's Law being what it is, I did, indeed, find that one of the 24 numbers in the listing was incorrect by one digit, and corrected it (Figure 11). To facilitate keeping the expiration dates file current, you should obtain a copy of an option expiration calendar from your broker, or by writing to the Chicago Board Options

Figure 10.

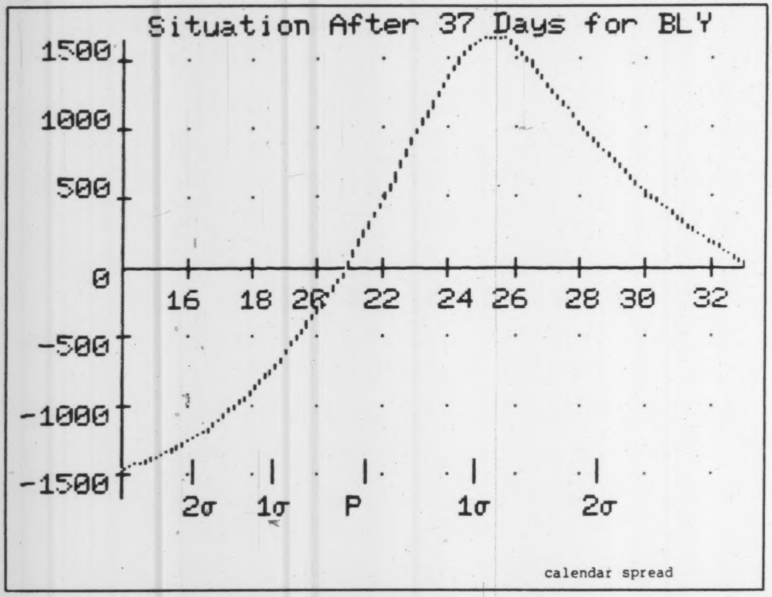
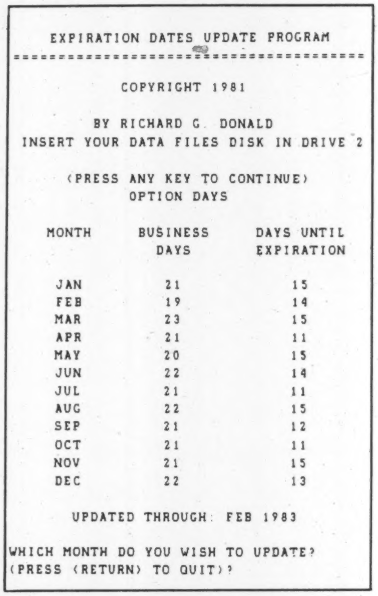


Figure 11.



```
         EXPIRATION DATES UPDATE PROGRAM
=========================================

             COPYRIGHT 1981

          BY RICHARD G. DONALD
  INSERT YOUR DATA FILES DISK IN DRIVE 2

        (PRESS ANY KEY TO CONTINUE)
             OPTION DAYS

    MONTH      BUSINESS       DAYS UNTIL
                 DAYS         EXPIRATION

     JAN          21              15
     FEB          19              14
     MAR          23              15
     APR          21              11
     MAY          20              15
     JUN          22              14
     JUL          21              11
     AUG          22              15
     SEP          21              12
     OCT          21              11
     NOV          21              15
     DEC          22              13

       UPDATED THROUGH: FEB 1983

WHICH MONTH DO YOU WISH TO UPDATE?
(PRESS (RETURN) TO QUIT)?
```

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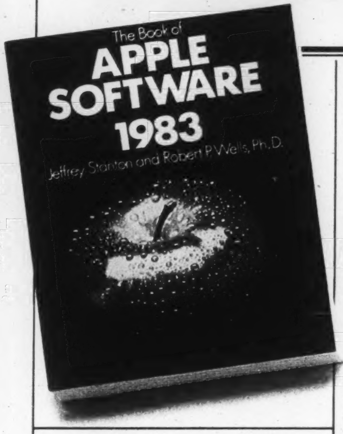

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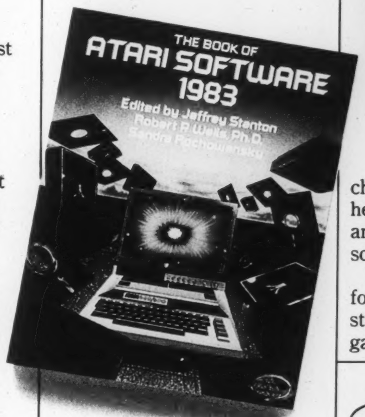

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Stock Options, continued...

Exchange (they're free). There is always a current calendar in the front of the Daily Graph *Stock Option Guide.*

SOAP comes with a data file of 75 stocks in the volatility file. The file update menu and partial listing of the file is shown in Figure 12. The only complaint I have with this part of the program is that the date of the last update is not shown on the monitor nor is it printed when a printout is requested.

The manual suggests updating the volatility file monthly. I feel that is the minimum requirement. As pointed out in the manual, option prices and option price prediction are very dependent on the volatility of stock prices. I would update this file twice a month, or weekly during strong stock market moves—either up or down; then print the volatility file and date it.

When creating your own volatility file or adding to the existing one, you will need to obtain a volatility figure. You can either get it from your broker or approximate it using the simple equation found on page B-3 of Appendix B in the manual (no calculator required).

Figure 12.

```
          FILE UPDATE PROGRAM
FUNCTION MENU:

  1) MANUALLY UPDATE OR CHANGE ENTRIES
  2) AUTO UPDATE (WITH MODEM)
  3) ADD ENTRIES TO FILE
  4) RE-ORDER ENTRIES
  5) WRITE NEW DATA FILE TO DISK
  6) VIEW OR PRINT VOLATILITIES
  7) QUIT

ENTER ONE OF ABOVE NUMBERS *6
DO YOU WISH TO:

1) VIEW VOLIT FILE DATA
2) PRINT VOLIT FILE DATA (40 COL)
3) PRINT VOLIT FILE DATA (80 COL)
4) RETURN TO MAIN MENU

*1
TIC CY  PRICE   VOLIT   DIV  DIV DATE

ABC  2 33 1/2   0.296  0.40  2/19/XX
AET  1 45 1/2   0.224  0.58  3/18/XX
AMH  2 19 1/8   0.508  0.10  3/1/XX
AA   1 24 5/8   0.220  0.45  2/08/XX
ACY  1 26 1/4   0.268  0.44  2/20
AHS  2 41 7/8   0.213  0.27  3/12/XX
T    1 56 1/4   0.142  1.35  2/23/XX
ASA  2 34 1/4   0.437  1.25  2/20/XX
AVT  2 46 3/8   0.324  0.25  3/5/XX
AVP  1 24       0.224  0.75  2/9/XX
BLY  2 28 7/8   0.344  0.03  2/3/XX
BAX  2 32       0.283  0.10  3/12/XX
BA   2 17 1/2   0.312  0.35  2/13/XX
BGH  1 34       0.322  0.65  1/7/XX
BC   3 16 3/8   0.645  0.25  1/21/XX
KO   2 32 3/4   0.198  0.58  3/1
CDA  2 30       0.322  0.13  3/14
GLW  3 40 1/4   0.259  0.58  3/15/XX
DAL  1 30 1/2   0.358  0.25  2/5
DEC  1 75 3/4   0.244  0.00
```

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Address Apt. No.
City State
Zip Code
Profession

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Ⓓ

COMPUTER CONFIGURATION
1) Computer Model* (Check 1)
  ☐ TRS 80 MODEL I - Level II
  ☐ TRS 80 MODEL III - Level II
  ☐ TRS 80 Color Computer
  ☐ Apple II with Integer Basic Firmware Card
  ☐ Apple II with Applesoft Firmware Card
  ☐ Apple II Language System
  ☐ Atari 400
  ☐ Atari 800
2) Memory (Check 1)
  ☐ 16 K Bytes
  ☐ 24 K Bytes
  ☐ 32 K Bytes
  (TRS Disk Systems require a minimum of 32 K)
  ☐ 48 K Bytes
  (Apple Disk Systems require a minimum of 48 K)
3) Number of Disk Drives (Check 1)
  ☐ None
  ☐ 1
  ☐ 2 or More
4) Cassette Interface (Check 1)
  ☐ Yes
  ☐ No
5) Other Accessories (Check Maximum of 3)
  ☐ Color Monitor
  ☐ Printer
  ☐ Joysticks or Paddles

*Apple, Atari and TRS 80 are the trademarks of Apple Computer Inc., Atari Inc. and Tandy Corp. respectively.

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CIRCLE 279 ON READER SERVICE CARD

Stock Options, continued...

Summary

Some additional comments. The program is sold "as is." It is not for the novice investor. If you are interested in learning about options so you can use them as part of your investment program, *SOAP* can be a valuable aid, especially when it is used with one or more of the popular books available, such as L.G. McMillan's *Options As A Strategic Investment,* New York Institute of Finance, NYC, 1980. A numeric keypad would be a big help since there is so much numeric data to enter.

I did find a couple of bugs in the program. They are not serious and can be avoided. I notified H & H Scientific and they are, as of this writing, correcting them.

> ***After three or four trial runs I felt right at home with the program.***

The most significant one occurs when you have completed an analysis and return to the input summary (Figure 7). When the month is the only item changed and is followed by execute, the program does not accept the change and reuses the previously entered data.

The other bug occurs when creating a new option file. If the line number of a request for data is entered instead of a 0 or a -1 as requested in lines 2 and 3, you get a type mismatch error and drop out of the program completely.

All in all, the *Stock Option Analysis Program* is well done considering its complexity. The enormous amount of time this program saves you is alone worth the price. If you use options as part of your investments, the *Stock Option Analysis Program* is a must addition to your library of investment analysis software.

For More Information

Dow Jones News Retrieval, Dow Jones & Company, Inc., Box 300, Princeton, NJ 08540.

Daily Graphs *Stock Option Guide*, William O'Neil & Co., Inc., P.O. Box 24933, Los Angeles, CA 90024.

The Options Clearing Corporation, 200 South Wacker Dr., Chicago, IL 60606. ☐

Videx INC. T.M.

Videx, a frontrunner in microcomputer peripherals and software, announces two exciting new programs that will make existing software compatible with the 80-column VIDEX VIDEOTERM.

APPLE WRITER][

pre-boot with 80-Column Display

This program allows an 80-column display for your APPLE WRITER][, and access to true upper and lower case input from the keyboard. When combined with the ENHANCER][, this program will provide a complete word processing package.

Interested in word processing in different languages? The pre-boot program has been set up to allow APPLE WRITER][to prompt in other languages. With an Enhancer][, the keyboard can be programmed to be compatible with different languages.

$19.00
Suggested retail price

VisiCalc™

pre-boot with 80-Column Display

Now you can view the VisiCalc electronic worksheet window in 80 columns. Since the entry line is also 80 columns wide, complex formulas can now be seen in their entirety for editing ease. An added bonus is the ability to display upper and lower case.

$49.00
Suggested retail price

For those who need even more power, a more advanced version combines all the above features with the ability to use many of the memory expansion boards currently available. A configuration editor allows VisiCalc to use a mixture of different kinds of memory expansion cards. Just tell it what memory cards you have and which slots they are in. For example, you could use more than one language card equivalent. The memory cards can be combined to give you access up to 176 K of memory!

$89.00
Suggested retail price

897 N.W. Grant Ave. • Corvallis, Oregon 97330 • 503/758-0521

CIRCLE 284 ON READER SERVICE CARD

Inside Apple

Apple Computer Inc., 20525 Mariani Avenue, Cupertino, California 95014 Vol. 1 No. 2

For the authorized Apple dealer nearest you, call 800-538-9696 (800-662-9238 in California.)

Fruitful Connections.

There are more people in more places making more accessories and peripherals for Apples than for any other personal computer in the world.

Thanks to those people — in hundreds of independent companies — you can make the humblest 1978 Apple II turn tricks that are still on IBM's Wish List for 1984.

But now we're coming out with our very own line of peripherals and accessories for Apple® Personal Computers.

For two very good reasons.

First, compatibility. We've created a totally kluge-free family of products designed to take full advantage of all the advantages built into every Apple.

Second, service and support. Now the same kindly dealer who keeps your Apple PC in the pink can do the same competent job for your Apple hard-disk and your Apple daisywheel printer.

So if you're looking to expand the capabilities of your Apple II or III, remember:

Now you can add Apples to Apples.

A joy to behold.

The new Apple Joystick II is the ultimate hand control device for the Apple II.

Why is it such a joy to use?

With two firing buttons, it's the first ambidextrous joystick — just as comfortable for lefties as righties.

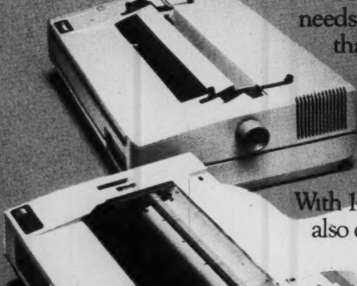
Of course, it gives you 360° cursor control (not just 8-way like some game-oriented devices) and full X/Y coordinate control.

And the Joystick II contains high-quality components and switches tested to over 1,000,000 life cycles.

Which makes it a thing of beauty. And a joystick forever.

Gutenberg would be proud.

Old Faithful Silentype® has now been joined by New Faithfuls, the Apple Dot Matrix Printer and the Apple Letter Quality Printer.



So now, whatever your budget and your needs, you can hook your Apple to a printer that's specifically designed to take advantage of all the features built into your Apple. With no compromises.

The 7x9 Apple Dot Matrix Printer is redefining "correspondence quality" with exceptional legibility. With 144x160 dots per square inch, it can also create high resolution graphics.

The Apple Letter Quality Printer, which gets the words out about 33% faster than other daisywheel printers in its price range, also offers graphics capabilities. See your authorized Apple dealer for more information and demonstrations. Because, unfortunately, all the news fit to print simply doesn't fit.

©1983 Apple Computer Inc.

Up the creek without a paddle?

Or lost in space? Or down in the dungeons?

Whatever your games, you'll be happy to know that someone has finally come out with game paddles built to hold up under blistering fire. Without giving you blisters.

Apple Hand Controller II game paddles were designed with one recent discovery in mind:

People playing games get excited and can squeeze very, very hard.

So we made the cases extra rugged. We used switches tested to 3,000,000 life cycles. We shaped them for holding hands and placed the firing button on the right rear side for maximum comfort.

So you'll never miss a shot.

A storehouse of knowledge.

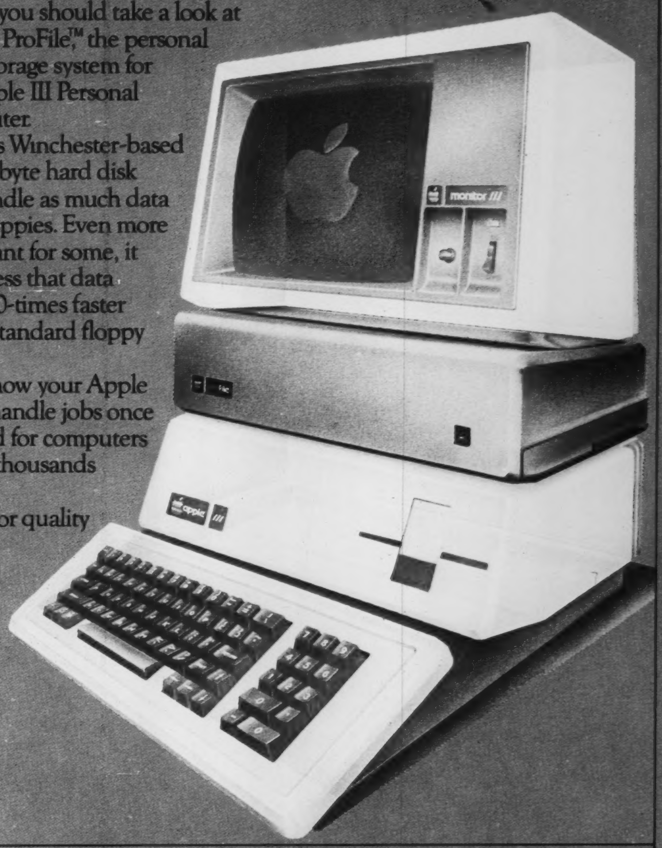
If you work with so much data or so many programs that you find yourself shuffling diskettes constantly, you should take a look at Apple's ProFile,™ the personal mass storage system for the Apple III Personal Computer.

This Winchester-based 5-megabyte hard disk can handle as much data as 35 floppies. Even more important for some, it can access that data about 10-times faster than a standard floppy drive.

So now your Apple III can handle jobs once reserved for computers costing thousands more.

As for quality and reliability, you need only store one word of wisdom:

Apple.



Launching pad for numeric data.

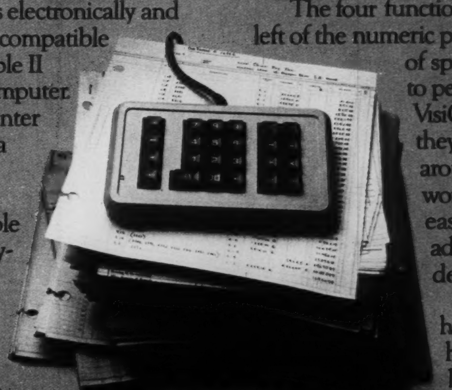
Good tidings for crunchers of numerous numbers:

Apple now offers a numeric keypad that's electronically and aesthetically compatible with the Apple II Personal Computer. So you can enter numeric data faster than ever before.

The Apple Numeric Keypad II has a standard calculator-style layout. Appropriate, because unlike some other keypads, it can actually function as a calculator.

The four function keys to the left of the numeric pad should be of special interest to people who use VisiCalc.® Because they let you zip around your work sheet more easily than ever, adding and deleting entries.

With one hand tied behind your back.



CIRCLE 107 ON READER SERVICE CARD

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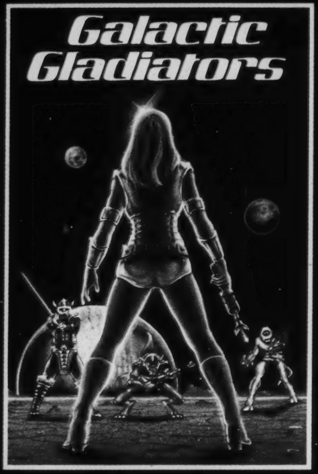
FIRST, SSI GAVE YOU GALACTIC GLADIATORS.™ NOW WE BRING YOU GALACTIC ADVENTURES.™

When we first introduced GALACTIC GLADIATORS™ — a strategy simulation of cosmic combat — it didn't take long before it became one of our bestsellers. And no wonder, it had the perfect script crammed with fast-paced action, fun and excitement. Using Hi-Res color graphics, it created an alien setting filled with wild and bizarre creatures shooting it out Western style. Except instead of guns, they're armed with phasor rifles, laser swords, the Death Touch, and other exotic weapons!



Now we are proud to present its sequel — GALACTIC ADVENTURES.™ More than a game of tactical battles, it is a full-fledged science-fiction, role-playing adventure strategy simulation. It starts out by taking you to a space port of an alien planet. As a stranger in a strange land, you must go into the Streets to get combat experience. And what better way than by getting into a few fights? You must also learn assorted Advanced Skills (such as Noetic Logic, Linguistics, Star Piloting, Lockpicking), earn some money and recruit fellow adventurers to join you. Only then can you hope to survive off-worldly forays and eventually achieve the title of Independent Adventurer.

To embark on an adventure, you must apply to one of four guilds, each stressing different Advanced Skills. All of them will send you to different worlds, where who-knows-what awaits you. You may find nothing or you may find treasures. Then again, there may be monstrous creatures just **dying** to kill, maim or capture your team. If between fleeing and fighting, you choose the latter, you'll get a complete strategy game of tactical combat.

Unlike other adventure games, this one doesn't just use a bunch of text to describe the action. Instead, screenfuls of Hi-Res color graphics vividly depict all the different unearthly battlegrounds, the warriors and their movements.

Aside from all the adventures already prepared by our designer, you can create your very own — ones that are as long and intricate as you like. You can even store all of them on disk for future play.

But before you can start on any of these Galactic Adventures, you've got to take a little down-to-earth trip first. And that's a quick jaunt to your local game or computer store today!

GALACTIC ADVENTURES™ ($59.95) is available on 48K mini floppy disk for the Apple® II Plus or Apple II with Applesoft ROM card.

GALACTIC GLADIATORS™ ($39.95) comes on 48K disk for both the Apple and the Atari® 400/800.

RapidFire

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CIRCLE 289 ON READER SERVICE CARD

Calculating Return On Real Property

Don Cooley

The *Real Estate Analyzer,* as its name does not imply, is a user-friendly program—so user-friendly that you can begin to use the program almost without referring to the manual.

When I received *Real Estate Analyzer* for review, I sat down and skimmed the manual to get a general feeling for the program and how it approached real estate investment analysis. It appeared to be a straightforward approach, so I put the manual down and booted the program.

Structure

The program comes on one disk that is not copy-protected. Howard Software Services say that they will allow you to make one copy for backup purposes and to make additional copies in case of damage to the previous copy. They say that they do this to eliminate the cost and time delay in obtaining backup copies. They then warn about copyright violations and ask you to show the same consideration by not abusing the privilege of copying. They will replace an original, damaged disk for a $15 service charge.

I think this is an excellent method of handling this problem. Certainly they have the customer's best interest at heart, and they are willing to rely on the integrity of their customers. I wish more software developers would take this attitude.

Since this type of package must change every time the tax laws change, an update service is a must. Howardsoft will update all registered owners of the software for a fee—currently $50.

The program starts with a menu that gives you a choice of performing a new analysis, generating reports from the old data on file, changing the disk defaults, preparing new storage disks, or deleting unwanted files.

> ***Since this type of package must change every time the tax laws change, an update service is a must.***

The Analysis

The program steps you through the gathering of the information needed to do the analysis. This is done by sections which include general information, loan information, depreciation, income, expenses, inflation factors, tax rates, and selling costs.

All of the information can be recalled from a previous file stored on the disk, if you have done an analysis on the property before. Each section of the program starts by asking you if you want to change any of the information. If you do, it steps you through each question giving you a chance to verify or change each item. Then, at the end of each section, it again allows you a chance to review and change each item. Otherwise, you can move on to the next section.

General information includes year of purchase, purchase price, date of analysis, current market value, past loan reduction, and past cash flow. The last two items are important only when you are analyzing a property you currently own.

Loan information lets you enter up to ten loans that can be fully amortized, amortized with a balloon payment, interest only, or any other type of loan for

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SOFTWARE PROFILE

Name: Real Estate Analyzer
Type: Personal Finance
System: 48K Apple II, II+
or III, disk drive;
64K IMB PC, disk drive.
Format: Disk
Language: Basic
Summary: Good program,
easy to use.
Price: $195, Apple; $250 IBM
Manufacturer:
Howard Software Services
8008 Girard Ave., Suite 130
La Jolla, CA 92037

Don Cooley, 20200 Via Santa Teresa, San Jose, CA 95120.

which you can specify the principle and interest payments on a year-by-year basis. This last option is particularly useful in our current economic situation. It lets you choose the best of the many different financing plans being offered by banks and other lending institutions.

You may use up to ten different depreciation items. Each item has its own life, recapture rule, and type of depreciation, including the new Accelerated Cost Recovery System of the 1981 Economic Recovery Act.

The section on income allows you to enter up to 50 leases with the beginning and ending year of each lease and the scheduled monthly income. It also allows you to enter a percent of the *scheduled* income for a vacancy factor.

The main flaw I found in the program is in the expense section, which differs from commonly accepted practice. Usually expenses are expressed from commonly accepted practice. Usually expenses are expressed as a percentage of *scheduled* income. Every analysis I have seen, as well as the accepted methods of the National Association of Realtors, uses this method. The *Real Estate Analyzer* however, expresses the operating expenses as a percentage of the *market value* of the property. The only saving grace is that you can input the dollar amount for each expense and the program will figure the percentage for you.

However, when you have worked with percentages as a factor of the income, it is very disconcerting to change your thinking to accommodate a computer program. All real estate agents who work in investment properties know the average percentage of *income* for investment properties and can do an analysis based on these averages. For this reason, I think that the program is best suited to someone other than a professional real estate agent who specializes in investment properties.

One of the big pluses of the program is that it allows you to express, separately, inflation factors for the property value, operating expenses, rental income, and property taxes. These factors, many times, are different, and it is very handy to be able to enter them separately.

Another unique feature is that you can enter a money rate for any interest you receive on cash generated or a charge against any debt incurred by a negative cash flow. Then you can input anticipated tax rates for both ordinary income and capital gains tax. Finally, you enter the selling costs of the property.

The Report

You can do a report from files on the disk or from the results of the new input. It can be printed in a report year-by-year for up to ten years. The report includes the following: pre-tax cash flow; after-tax cash flow; total return on investment (ROI); total internal rate of return (IRR); equity ROI; equity IRR; return on equity; conventional IRR; and financial management rate of return (FMRR).

The program provides several parameters to ensure compatibility between the software and the printer. You can set the margins, characters per line, and lines per page. You can initialize the printer to print in compressed mode, emphasized type, double strike, or other modes if your printer has these capabilities.

> ***One of the big pluses of the program is that it allows you to express, separately, an inflation factor for the property value, operating expenses, rental income, and property taxes.***

You can format the report to have a title page and to print the background information and the assumptions for the analysis. You may also choose to print a heading at the top of each page and a separate page for each of the reports. The finished product is a very attractive report.

Documentation

The documentation includes an attractive, three-ring, 7" x 9", padded binder. The documentation is well written and easy to follow. However, I found myself having to page through the manual to find some answers because there is no index. An index certainly would make life much easier. The section on definitions of real estate investment terms is quite adequate.

In addition, there is a section on understanding investment analysis. Here the author attempts to give a short description of the different analyses performed, along with the formulas used to arrive at the results. Reference books are listed for those who want more details. This section is well done and provides an idea of what the different returns are all about. For the experienced person, it is a good short review. For the inexperienced, it is an adequate introduction.

The last section shows sample printouts of the reports. These have been done with a dot-matrix printer, then reduced to half-size, making them very difficult to read.

Also included with the program is a demonstration on disk. Although I did not go through the demo first, I later wished I had—it would have saved some time.

Suggestions For Improvement

Everything is figured on a full year basis. If you were purchasing a property in the middle of a year, the program would not give you figures for the few remaining months. Although this is not a serious limitation, it would have been nice to be able to calculate partial years.

In the ROI analysis, the program shows the taxes on gains as a part of sales expense. Although there isn't any question that the tax on the capital gains is a cost, it is not normally included as an expense of the sale.

Although the program must calculate the principle and interest on an amortized loan, it does not provide the monthly payment. It would help if the program would report the payment at the time the loan information is given and in the printed assumptions.

One of the problems in listing the rental income is that the program asks for the leases on the property. In the process, it asks for the ending date of the lease.If the lease has fewer than10months to go, the amount is dropped from the reports at the end of the lease term. There is no provision to include another lease when the current one expires.

In addition, the *Real Estate Analyzer* calculates the inflation factor for the total income each year, even though you may not have a cost of living increase built into the lease. A better way to handle this would have been to ask for the rentable square footage and the average rent per square foot. This would then give you a gross scheduled income to which you could apply the vacancy factor. If you used existing leases at the beginning and the building was not fully occupied at that time, you could be applying a vacancy factor to a building that was partially vacant.

With a full understanding of the limitations above, I suggest that this program would be very useful to someone who wants an estimate of return on property that is presently owned or being considered for purchase. It certainly would allow you to compare different properties and their returns prior to purchase. In the hands of a real estate agent, it would help show a client what he could expect as a return on his investment.

Both the Apple and IBM packages are identical in their operation and the reports they produce. ☐

Now we've made Accounting Plus II™ even more tempting... Payroll Plus.

If you think computer payrolls simply mean paychecks and W-2's, then our versatile *Payroll Plus* will really tempt you. It brings a new dimension to our Accounting Plus II — the industry standard for all Apples.

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Payroll Plus operates with Apple II, Apple II Plus or Apple III with either floppy disk drives or hard disks. If you use another system, you'll be glad to know *Payroll Plus* also works as a stand-alone package.

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Software Dimensions, Inc.
6371 Auburn Boulevard
Citrus Heights, CA 95610
916/722-8000
CIRCLE 273 ON READER SERVICE CARD

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INFOCOM
The next step downward to danger
ZORK II
INFOCOM
It all comes down to this.
ZORK III
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And 12 Hours to solve the murder.
DOCUMENTARY EVIDENCE
DEADLINE
First of the INTERLOGIC Mystery Series from Infocom.
STARCROSS
INFOCOM

WE'RE WRITING

THEM AS FAST AS WE CAN!

At the rate we're going, we'll have these pages filled by 2083. And by 2084, people will be clamoring for the next Infocom creation.

We hate to disappoint our public. So we keep you waiting. Because while the software factories are cranking out arcade game after arcade game, pulpy adventure after trite fantasy, we're writing and rewriting, honing and perfecting. Before a single person enters one of Infocom's worlds, it must be crafted into a living, riveting, definitive experience.

Judging from the public's reaction, it's worth the wait. For instance, *Creative Computing* welcomed DEADLINE™ as "thoroughly engrossing and realistic," while a *Softalk* readers' poll recently voted ZORK™ I and ZORK II the most popular adventures of 1981.

And now, for the moment, your wait is over. ZORK III, your final step in the underground trilogy, and STARCROSS,™ an exploration of a new dimension in science fiction, are ready for you.

Look at them up there, the little worlds of Infocom. As our universe expands, companions will come to help fill that vast expanse of white space. Till then, they'll continue to stand alone as the best of all possible worlds.

INFOCOM™
55 Wheeler Street, Cambridge, MA 02138

Infocom's worlds are available for Apple,® Atari,® IBM, TRS-80,® Commodore, NEC, Osborne, CP/M,® and DEC.™

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Check Register and Accounting System, Too?

> *Good grief! What is this we find on our pages? A review of a checkbook balancing program—the very thing we have so cynically pooh-poohed for so many years. We never thought we'd see the day, but here it is. We have published a review of a check register program that made us want to buy one. If you are still waiting for the day, read on.* —*EBS*

C. A. Johnson

I have seen several programs that provide a record of checkbook activity. Generally, they provide a subroutine for balancing your checkbook against the monthly bank statement, and not much more. For me, they have been more trouble than they were worth.

Perhaps, I did not learn how to use them properly, but it appeared to me that they more than doubled the work of maintaining my checkbook. When you have to keep a manual record so that you will know the status of your bank account any time you write a check, entering the data again into the computer just to reconcile your records with the bank statement hardly seems worth the effort and takes longer than balancing with a pocket calculator.

So, I had given up on computerizing my checkbook records—until *Maxi C.R.A.S.*

Maxi C.R.A.S. is not only a check register system, but an excellent double entry accounting system, as well. It is a conversational, menu-driven program. It is so user-oriented that even the newest computer tyro can use it without difficulty, yet it provides a sophisticated set of reports which are designed to aid in money management and ease the pain of completing the Internal Revenue Service forms.

The documentation is well written, clear, and to the point. All features of the program appear to have been dealt with in an excellent manner. Some hints on advanced uses of the program are provided, but I am convinced that there are many additional applications and variations of this program which will be developed by those who make serious use of it.

The Account Structure

Naturally, as with any accounting system, the first chore is to define the account structure. In *Maxi C.R.A.S.*, you may establish as many as 223 accounts, divided in any way you choose between expense and income accounts. Once the account structure has been established and the transactions entered, the account structure cannot be altered nor can any of the transactions be edited. Of course, you can always start over, define a new account structure and reenter the data, if you wish.

To allow for oversights in defining the accounts, I recommend that you include several "undefined" accounts in both the expense and income account lists. *Maxi C.R.A.S.* allows you to edit the account titles later. If you reserve a larger number of accounts than you initially think you need and enter the extra accounts with blank titles, you may add the actual titles later. The accounts will be there to use as you discover your need for them.

creative computing
SOFTWARE PROFILE

Name: Maxi C.R.A.S.
Type: Checkbook Processor
Systems: TRS-80 Model I or III, 48K, 2 Disk Drives
Format: TRS-80 Disk (Both Model I and III included)
Language: Basic
Summary: Excellent menu-driven double entry accounting system
Price: $99.95
Manufacturer:
Adventure International
P.O. Box 3435
Longwood, FL 32750

C. A. Johnson, 3619 Sugarhill Dr., San Antonio, TX 78230.

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Maxi C.R.A.S., continued...

The program does not restrict you to a one check-one account entry. If you write a check for a group of items which span several accounts, you may enter the total amount of the check for the check register and then break out the amounts to be entered into the accounting system according to the accounts to which they belong.

It is a standard practice in accounting that nothing is ever erased once it is entered into the books. Errors are generally corrected by entering new transactions, properly identified as corrections, to offset the errors. *Maxi C.R.A.S.* conforms to this practice.

After entering the data for a transaction into the computer, you are given a last chance to review it and either cancel it or add it to the disk file. You may include a note as part of the transaction if an explanation is desired. Once the transaction has been written to disk, however, it cannot be changed.

By including a CASH account, you can handle cash expenditures without affecting your checkbook balance. This is done by entering a 0.00 for the check amount and offsetting the purchase with a negative CASH amount and a positive amount for the other accounts.

Printing Checks

Maxi C.R.A.S. provides for printing checks as well as reports. At the time the transactions are entered, you are asked if you wish to print the check. If you reply "Yes," a notation is made into a special file. When you are ready to print checks, you select the proper item from the menu and indicate whether you are using continuous form checks.

If you answer N you may print checks singly. The program will *not* allow you to print a check more than once. If you wish to use window envelopes to mail your checks, you may build an address file and the program will pick up the address and include it on the check at printing time.

Several useful reports are provided. The Check Register Statement (Figure 1) is a two-page report (too wide for a single page printing) showing all of the transactions during the month with a running balance.

Other reports include check Register Notes, Income and Expense Account Subtotals (Figure 2), selected Account Statement (Figure 3), Checkbook Reconciliation, and Account Distribution Statement (Figure 4).

Pros and Cons

One of the outstanding features of *Maxi C.R.A.S.* is its ability to interface with VisiCalc. The format for the file set up for VisiCalc is as follows: Account names are in the first column, opening balances for each account in the second column, and monthly balances in the remaining columns. Once you get the data into VisiCalc, you can manipulate it in many ways. If you are a VisiCalc

Figure 1.

```
09/26/82               Check Register for September, 1982                Page 1

                    A. B. Yourname      123-345-6      AnyBank USA

--------------------------------------------------------------------------------
 TXN :Day:C:Check:          Payee/Payor           :          In Payment Of
  #  :   :*:  #  :                                :
-----:---:-:-----:--------------------------------:-----------------------------
Opening balances
    1:  2: :     :Magazine A                      :Stop Smoking
    2:  4: :  501:Local Office Supply Store       :5 Reams Paper
    3:  4: :  502:Cash                            :Petty Cash
    4:  5: :     :Post Office                     :Postage
    5:  7: :  503:Youbuyit Office Supply          :Typist Chair
    6:  8: :     :Youreadit Publishers            :Second year royalties
    7: 15: :     :Self                            :Transportation
    8: 20: :  505:Local Office Supplies           :Envelopes

Closing balances for September, 1982


--------------------------------------------------------------------------------

09/26/82               Check Register for September, 1982                Page 2

                    A. B. Yourname      123-345-6      AnyBank USA

--------------------------------------------------------------------------------
          :   Amount Paid   : Amount Received :     Balance     ::N: TXN :
          :                 :                 :                 ::*:  #  :
          :-----------------:-----------------:-----------------::-:-----:
          :                 :                 :          500.00 :: :     :
          :          0.00   :         250.00  :          750.00 ::*:   1:
          :         42.56   :           0.00  :          707.44 :: :   2:
          :        100.00   :           0.00  :          607.44 :: :   3:
          :          0.00   :           0.00  :          607.44 :: :   4:
          :         78.00   :           0.00  :          529.44 :: :   5:
          :          0.00   :       2,000.00  :        2,529.44 ::*:   6:
          :          0.00   :           0.00  :        2,529.44 ::*:   7:
          :         20.00   :           0.00  :        2,509.44 :: :   8:
          :-----------------:-----------------:-----------------::
          :        240.56   :       2,250.00  :        2,509.44 ::
```

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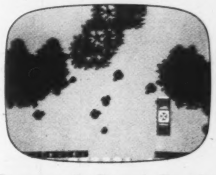

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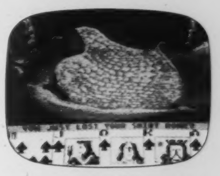

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devotee as I am, you will agree that this feature alone is worth the price of the program.

Of all the many things that *Maxi C.R.A.S.* does, there is only one that I am not happy with. The report program is designed to be used with continuous form paper. There is no provision for pausing at the end of each page to insert a new sheet of paper. I attempted to provide the Figures for this article with my daisy wheel printer and gave up in utter frustration. I could not insert the new pages quickly enough. It seems to me that it would have been a simple matter to have provided the capability to select either continuous feed or single sheet reporting.

Written specifically for the TRS-80, *Maxi C.R.A.S.* is supplied with both Model I and Model III versions. The Model I version comes on two disks, and the Model III is supplied on a single disk. Both versions are delivered on disks with TDOS, a stripped down version of DOSPLUS. If you wish to use a different operating system, the instructions for conversion are provided. □

Figure 2.

```
--------------------------------------------------------------------------------

09/26/82      Income & Expense Account Subtotals for September, 1982      Page 1

                A. B. Yourname       123-345-6       AnyBank USA

--------------------------------------------------------------------------------
No.:   Account Title    :  Opening Balance : Monthly Subtotal :  Closing Balance
---:--------------------:------------------:------------------:-----------------

  1:Office Supplies     :             0.00 :            62.56 :            62.56
  2:Postage             :             0.00 :            16.00 :            16.00
  3:Office Furniture    :             0.00 :            78.00 :            78.00
  4:Telephone           :             0.00 :             0.00 :             0.00
  5:Transportation      :             0.00 :            18.00 :            18.00

  6:Cash                :             0.00 :            66.00 :            66.00
  7:                    :             0.00 :             0.00 :             0.00
  8:                    :             0.00 :             0.00 :             0.00
  9:                    :             0.00 :             0.00 :             0.00
 10:                    :             0.00 :             0.00 :             0.00

 11:Article Sales       :             0.00 :          -250.00 :          -250.00
 12:Book Royalties      :             0.00 :        -2,000.00 :        -2,000.00
 13:Newspaper Features  :             0.00 :             0.00 :             0.00
 14:Ghosting            :             0.00 :             0.00 :             0.00
 15:Other               :             0.00 :             0.00 :             0.00

 16:                    :             0.00 :             0.00 :             0.00
 17:                    :             0.00 :             0.00 :             0.00
 18:                    :             0.00 :             0.00 :             0.00
 19:                    :             0.00 :             0.00 :             0.00
 20:                    :             0.00 :             0.00 :             0.00
```

Figure 3.

```
--------------------------------------------------------------------------------

09/26/82         Statement of Account No. 1 -- Office Supplies          Page 1

                   For September, 1982 through September, 1982

                 A. B. Yourname       123-345-6       AnyBank USA

--------------------------------------------------------------------------------
TXN#:MO:DA:    Payee/Payor     : In Payment Of   :CHK #:    Amount  :   Subtotal   :N
----:--:--:-------------------:-----------------:-----:------------:-------------:-
Opening balance                                        :            :         0.00:
   2: 9: 4:Local Office Supp:5 Reams Paper     :  501:       42.56:        42.56:
   8: 9:20:Local Office Supp:Envelopes         :  505:       20.00:        62.56:
```

Figure 4.

```
--------------------------------------------------------------------------------

09/26/82       Account Distribution Statement For September, 1982       Page 1

                A. B. Yourname       123-345-6       AnyBank USA

TXN #:          Payee/Payor            :ACT #:     Amount     :     Account Name
-----:---------------------------------:-----:----------------:--------------------
    1:Magazine A                       :  11 :         -250.00:Article Sales
    2:Local Office Supply Store        :   1 :           42.56:Office Supplies
    3:Cash                             :   6 :          100.00:Cash
    4:Post Office                      :   2 :           16.00:Postage
                                       :   6 :          -16.00:Cash
    5:Youbuyit Office Supply           :   3 :           78.00:Office Furniture
    6:Youreadit Publishers             :  12 :       -2,000.00:Book Royalties
    7:Self                             :   5 :           18.00:Transportation
                                       :   6 :          -18.00:Cash
    8:Local Office Supplies            :   1 :           20.00:Office Supplies
```

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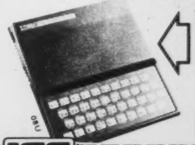

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My purchase of *The Accountant* by Decision Support Software has turned out to be one of my best software investment. My experience with the program has been "now that I know more, you mean I can do all that, too?"

The Accountant has three features which make it stand out: It is a double entry accounting system, you don't have to know what a double entry system is to use it, and it has an interface to Visicalc for advanced projections and planning which sells for $20.

Setting Up A Database

Upon booting a copy of *The Accountant*, you first see the main menu. A demonstration database which allows you to gain experience interacting with *The Accountant* is provided on the program disk. When ready, you select the menu option to Create A New Database. Whenever an action such as this, which might inadvertantly destroy the current database, is requested you are asked if you really want to do that before proceeding.

At this point, you decide whether to let the program disk contain the new database or to use a separate data disk. For most users this is not a critical decision. *The Accountant* uses memory very efficiently so very little disk swapping is required when one drive is used. If you make a large number of transactions per year, you may want to use a separate data disk since more room is then available for transactions. A disk holds from 2500 to 4000 transactions, which is more than enough for most users.

From here your options are to Create A Database or to Rollover from Last Year's. In the beginning, we obviously want the first option.

The next step is to define up to 63 accounts and 63 codes. Each account is designated as an Asset, a Liability, or a Reserve account. Bank accounts, cash, stocks, and property are examples of Asset accounts (Note that you may define as many bank accounts as you want).

Liability accounts include such things as charge accounts and loans. Budget type disbursements make up the Reserve list, which can include rent, insurance, utilities, groceries, etc. The manual suggests defining a reserve account called Equity to represent your net worth.

You may also want to set up Group accounts. By doing this, you may gain easy access to the sum of the balances of up to nine groups of accounts. For example: my utilities are defined as a Group, thus, it is convenient to find the total I pay each month for all utilities. I do the same for insurance, charge accounts, liquidity, and other general categories of interest.

Codes, which will later facilitate retrieving transactions, are defined. These are particularly good for tax purposes. Examples of some useful codes are long term gain, long term loss, short term gain/loss, charitable contributions, interest expense, and non-taxable income. Since I operate a small business from my house, I defined a code for business. Thus, all business transactions for which I pay with personal funds may be accounted for and later retrieved in a detailed breakdown for reimbursement (which also facilitates entry of each transaction into the company's general ledger).

Tax return time becomes *almost* enjoyable in a strange way as all tax related transactions are printed out by category, i.e., medical, gains, losses, interest expense/income, etc. Of course, we'll still save the old receipt shoe box *sans* organized printouts for the IRS auditor—why let others share our fun?

Once the accounts and codes are defined, you are ready to start entering transactions. Many examples are provided in the documentation and in the demonstration database. Decision Support has done an admirable job of "hand holding."

First, initial year entries are made to

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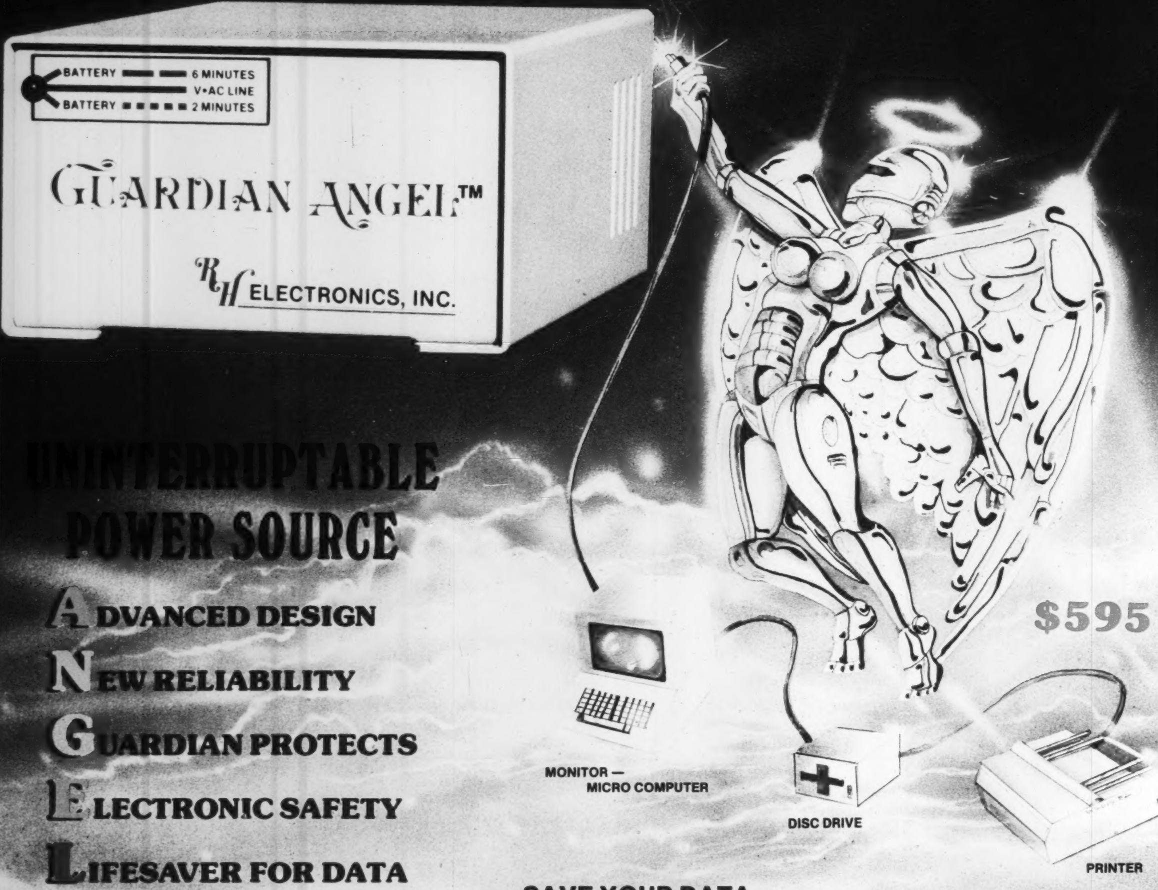

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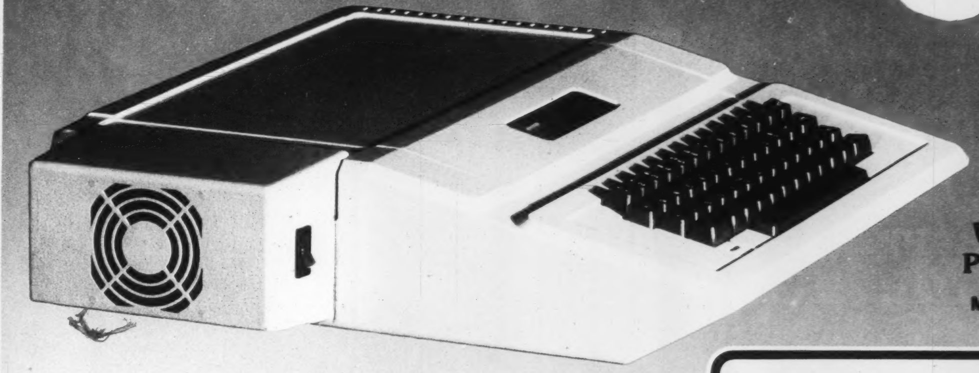

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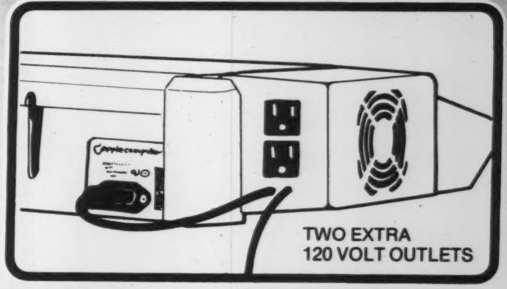

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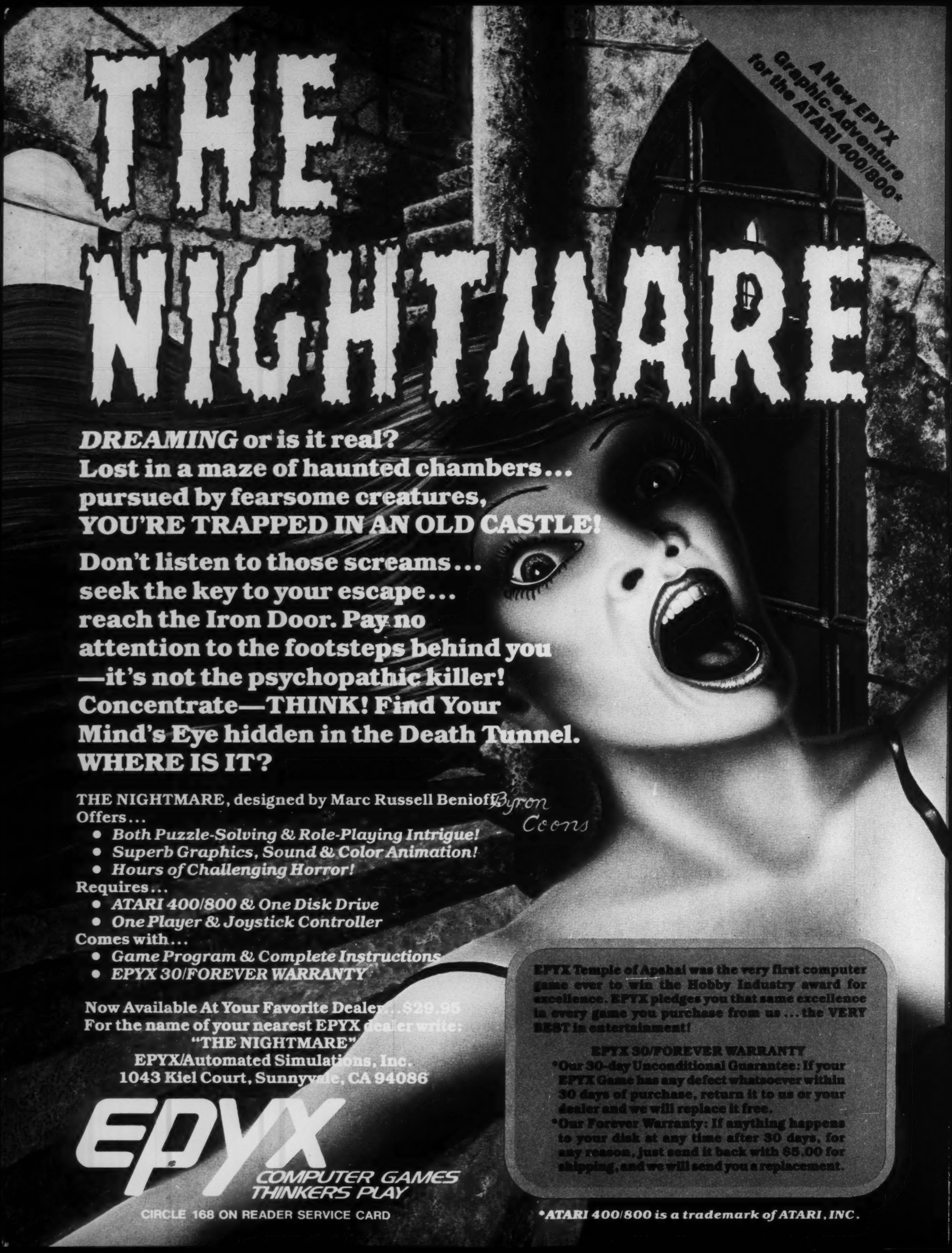

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show the status of each account at the beginning of the year. Next, individual transactions are entered. For the sadistically inclined, every penny can be accounted for by category. My own Cash account grows slowly, because I do not account for every soda pop. I simply adjust the Cash account via a Miscellaneous account each month to reflect near-reality.

As I mentioned earlier, you do not have to be an accountant to use *The Accountant.* For example: suppose you cash a check for $200. An accountant would debit Cash and credit Checking. By selecting the prompting mode from the main menu (which is also the default mode), you simply instruct *The Accountant* to Increase Cash and Decrease Checking by $200, and the computer decides which is the credit and which is the debit.

The date and a brief description, as well as a code if appropriate are supported for disbursements which cover more than one account. Also, the program is very fast. Transactions may be entered with nary a delay between them.

Several years ago I took an evening accounting class. At the end of the course I still did not know the difference between a debit and a credit. Because of the excellent tutorial included in *The Accountant* manual, I now feel comfortable with the basic principles of accounting.

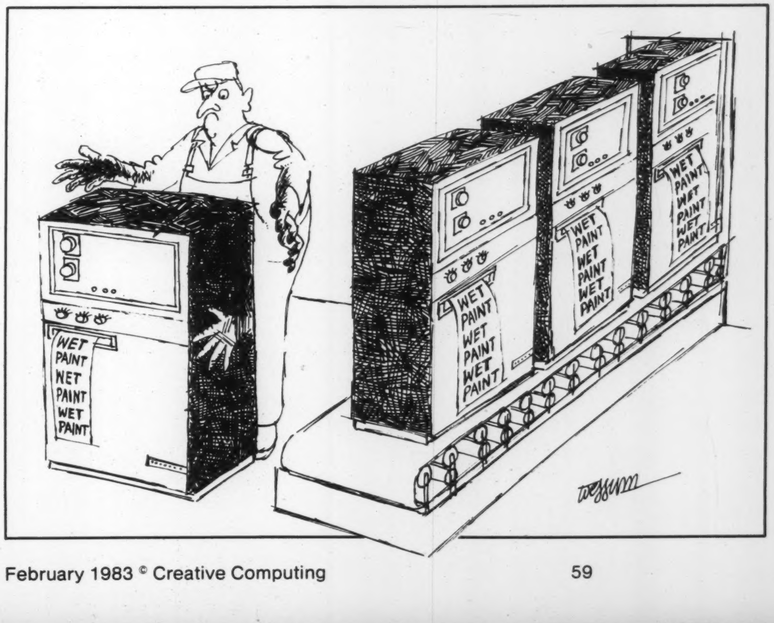
A very handy feature for entering data or querying the data base is the ability to abbreviate accounts and codes and have the program fill in the remainder. For example, entering CA RETURN will instantly display CAR INSURANCE or the first alphabetical account which starts with CA. If some planning is used in defining accounts and codes, most can be found by typing only the first letter or two. This saves a great deal of time by avoiding constant reference to a printed list. An alternative is to enter the number associated with each account and code (from 1 to 63) and, again, have the proper name filled in by the computer.

Some transactions, such as rent or mortgage payments, will usually be regular entries. For these, up to nine sets of automatic transactions may be defined. When requested from the main menu, these transactions will be posted automatically to the specified posting date.

For those regular transactions which vary in amount from month to month or week to week, you may request prompting to fill in the proper amount before they are posted. It is convenient to define a set of automatic transaction for common weekly expenditures such as groceries; another set for your paycheck to account for taxes, insurance, and other deductions; and another set for regular monthly expenditures such as rent and utilities. This feature saves a lot of redundant typing.

Querying the Database

Here *The Accountant* really shines. Transactions may be listed by numerical range, by date range, by specific account or code or by a combination of account and code. "Inverted" file pointers may be defined for specific accounts and codes which considerably speeds the retrieval of transactions by those accounts and codes no matter how large the database. Retrieval by transaction number or date range is already very fast.


WET PAINT WET PAINT WET PAINT
WET PAINT NET PAINT WET PAINT

A current balance sheet is also available from the main menu. Thus, your current net worth or the current balance of every charge account is always just the push of a button away. Similarly, it is a simple matter to see which of the Reserve accounts (groceries, entertainment, clothing,) are staying within budget.

When the Hardcopy option is turned on from the main menu, the results of all queries are sent to the printer.

Miscellaneous Features

Password protection is provided, but is intended only to deny a casual eavesdropper access to the database. A "desk top calculator" may be called up at any time for the four basic math functions. This is especially helpful when doing split transactions.

Transactions may be Rectified to correct errors, and the correction will be reflected in all the following months. Of course, professional accountants will probably wnat to enter a new transaction to correct an earlier mistake in order to maintain an audit trail.

Transactions are numbered automatically in chronological sequence. If a transaction is missed, it may be entered under the proper date by using Date Sequence Suppress from the main menu. When the session is terminated, the database will be rebuilt and transactions renumbered as required. During this rebuilding process, which may take from 1 to 25 minutes according to the size of the database, the program tells you approximately how long it will take a nice courtesy.

A Monthly Summary of Account command displays the ending balances each month of a specified account and also the change from month to month in that account. Each of these displays has an associated histogram for graphical representation. These displays may be sent to the printer if the Hardcopy option is in effect.

Finally, one of the nicest features—*The Accountant* disk is not copy-protected. A small "key" which fits in the game I/O socket is required to use the program. I have found that swapping the key with game socket peripherals causes no inconvenience when a port extender (recommended by Decision Support) is used to bring the game socket out of the Apple. In fact, this extender has proved very convenient for switching between joy stick and paddles for various games, thus, the port extender is a worthwhile $14.95 investment. (It is available from Decision Support for even less.) *The Accountant* may be copied for as many backups as will comfort you.

Accountant, continued...

Utilities

A utility disk adds the following capabilities:

- End of Month Balances which report an end of month balance for every account for a specified range of months.
- Monthly Report which lists transactions for a specified month first chronologically, then by account, and finally by code. The beginning balance, ending balance, and change are shown for each account.
- Year to Date Report which reports transactions for the entire year by account and by code for those accounts and codes which are currently inverted.
- Reconcile which reconciles differences between balances in *The Accountant* database and the balances reported by the bank, charge accounts, etc.

Actually, the first three functions can be done from the main program; the utility programs simply automate them. The Reconcile program has proved most useful for me. It is extremely easy to use and occasionally finds "lost" transactions, credit card company errors, and other mistakes. It is very pleasing to see the flashing "0.00" which indicates a reconciled balance.

Business Version

A business version of the program offers the following additional features:

- Definition of a fiscal year.
- Transactions up to one cent less than one million dollars. Assets up to ten million dollars.
- Five-part balance sheet (Assets, Liabilities, Equity, Revenue/Expenses, and Income) with separate sections for expenses and income.
- Up to 200 accounts.
- Multiple data disks (when one becomes full).
- Improved password protection.

A 16K memory board is required to use the business version. The price has not been announced as of this writing, but to those who want to upgrade from the personal version, only the difference between the purchase prices will be charged.

Conclusion

The Accountant brings the powerful personal financial management tools of a double entry accounting system to accountants and non-accountants alike. The documentation is thorough, easily read, and complete. My manual did not come with an index, but a new manual with index is now available. The program is so easy to use that rarely will reference have to be made to the manual.

The only problem I have experienced with this software is during the monthly reconciliation process. In order to use the Reconcile utility, each account to be reconciled must be an inverted account. I always turn off the "pointers" during data entry because with them on there is a relatively long delay between transactions. To turn the pointers back on requires a rebuilding time of about 12 minutes for the present size of my database. I also wish there were room for a longer transaction description, but then there would not be room for as many transactions on a disk.

I have found customer support from Decision Support to be exceptional. Questions are answered courteously and intelligently, updates are mailed promptly, and periodically a newsletter is sent out to answer questions and offer tips. After several months of heavy use, I have discovered no software bugs or error trapping problems.

As you may have guessed, I am a completely satisfied customer of Decision Support services and an enthusiastic user of *The Accountant.* □

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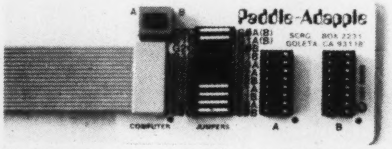

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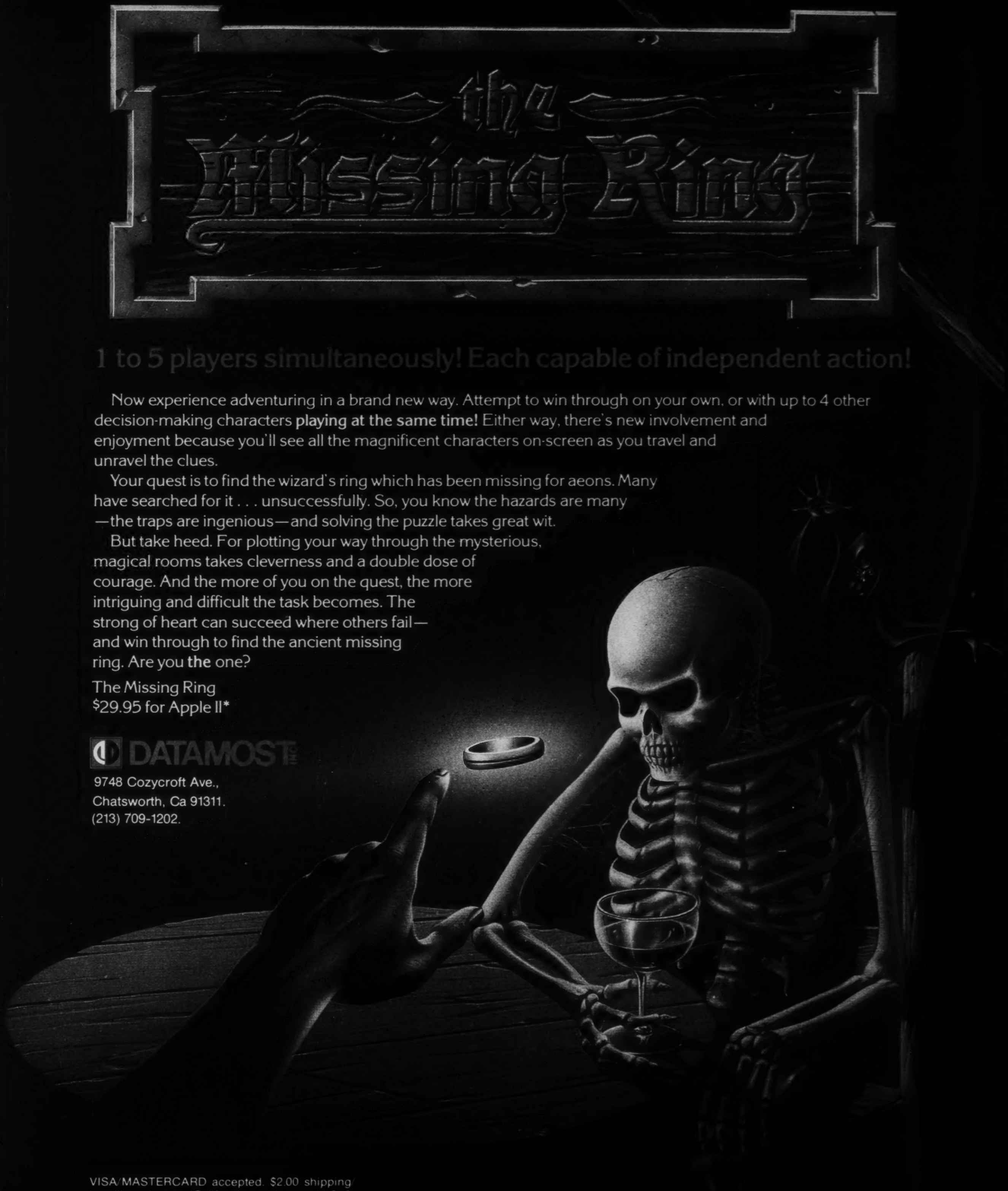
CIRCLE 281 ON READER SERVICE CARD



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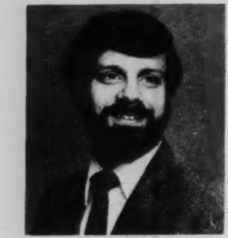
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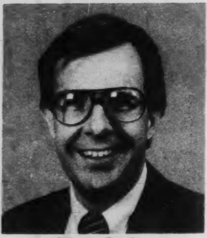
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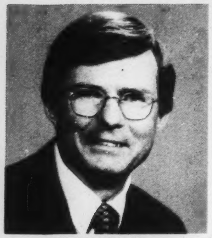
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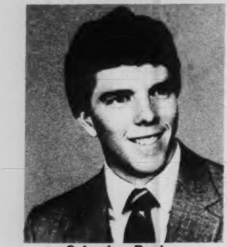
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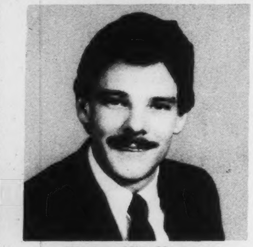
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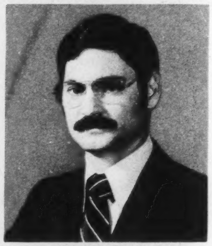
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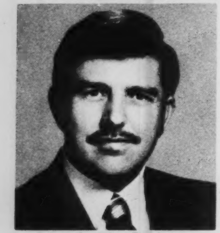
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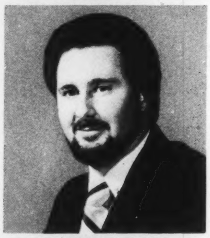
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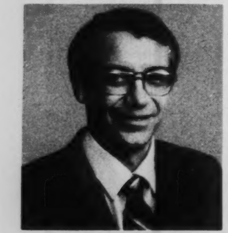
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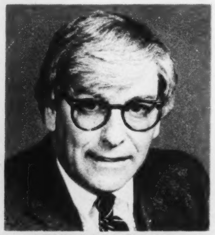
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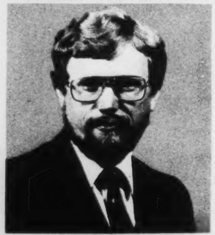
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It's A Bird, It's A Plane...

Dan Robinson

It's *Scripsit* in a blue cape. It can't leap tall buildings in a single bound, and it's still slower than a speeding bullet, but *SuperScripsit* is well named, for it is truly a super program.

Radio Shack's new word processor teams the TRS-80 with the Daisy Wheel II printer to produce proportional, justified printing that approaches book quality. Priced at $199, the program is much easier to use than its earlier Clark Kent version and contains most of the state-of-the-art features found in modern word processing programs.

The *SuperScripsit* package includes a pair of disks for the Model I and a pair for the Model III, eight half-hour lessons on audio cassettes, a 109-page training manual, a quick reference card, and a 144-page reference manual.

SuperScripsit may be called from TRSDOS together with the name of the text file to be processed, and fires up with the first of many menus which make the program user-friendly.

The Display

When entering text or editing, 14 text lines at a time are displayed above a format line. This line depicts margins and tab settings in inches and contains a ghost cursor that keeps pace with the text cursor. Below is the status line which contains the document name, the printed page and line numbers, and the position of the cursor in inches. The print pitch and line spacing for the current paragraph are shown together with indicators when certain modes are active.

Note the distinctions: although the screen may give equal space to every character, format, and print symbol, the status line is smart enough to consider only the space the characters will require in print, even given the variable width of proportional-font characters. Second, note that each paragraph may have its own margins, tabs, and line spacing.

The status line is further used as a mini-menu in answer to certain instructions and if an improper command is given, the status line is replaced by a flashing error message.

> ***The program is much easier to use than its earlier Clark Kent version.***

Text Control

SuperScripsit uses the familiar @ key for control in conjunction with letter and symbol keys. Unlike the original *Scripsit*, all of the combinations are logical: Control-D is used for delete, Control-I for insert and so on.

creative computing
SOFTWARE PROFILE
Name: SuperScripsit
Type: Word processor
System: TRS-80 Model I, III
Format: Disk
Language: Machine
Summary: Mild-mannered Scripsit now bends steel in its bare hands
Price: $199
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SuperScripsit offers a large number of cursor movements with the arrow keys. By themselves, the arrow keys move left and right a character at a time and wrap around to the next line when they reach the end of the current one. The up and down arrows move one screen line at a time and when shifted move to the beginning or to the end of the text file. A shifted left arrow moves to the left margin while a shifted right arrow moves to the next tab stop.

An arrow pressed in conjunction with H or F moves to the header or footer page, while an arrow pressed with W, G, P or V moves to the next/previous word, paragraph, printed page, or video page. An arrow with N permits an input to move to a specified printed page, and with an L to a desired line number on the current printed page. Finally, an arrow with S will move the cursor to a specified search string.

Other common commands are a little more sparse. For example, there is only one way to delete text: hold the control key and D to eat a character at a time. The alternative is to designate the text to be deleted as a block, call the block action mini-menu, select Delete, and finally answer an "Are You Sure?" prompt to erase the text.

Insertions are a little simpler. A control-I opens the text for unlimited insertion. When the insertion is completed, a delete command closes the text.

Special Features

A unique feature of *SuperScripsit* is the align tab. When this function is called, the text moves to the left of the

---

Dan Robinson, 1625 Higgins Way, Pacifica, CA 94044.

cursor as it is entered until the decimal point is keyed, and then the remaining input flows normally to the right. The result is an easy-to-use way to ensure that lists of figures will remain neatly in column even if the format of the paragraph is later altered. The align tab symbol may be changed from the default decimal point to any character, if needed to maintain a columnar presentation with product or part numbers and the like.

Another unusual feature offered by *SuperScripsit* is the tab line. Each paragraph contains its own tab and margin settings and tab and margin settings can be changed up to 50 times in a document. The tab line contains the left and right margins, tab settings, and an Indent tab to position the beginning of each new paragraph. The Indent tab may be set beyond the margin to provide reverse or hanging indentations for outlines.

The paragraph may use the system tab or call upon one of ten special tab formats stored by the program, all of which are programmable by the user. A quickset command may be called to set margins and the indent tab for individual paragraphs. A separate tab Help Menu appears if blunders are made while formatting tab lines.

If the print width is greater than the 64 characters available on the TRS-80 screen, the text may be "windowed" in eight-character increments to the left or right. Unlike the original *Scripsit,* the new program with its wraparound cursor movements makes windowing an easy-to-use aid to ensure that the printed copy will appear as the user intended.

Search and Block Commands

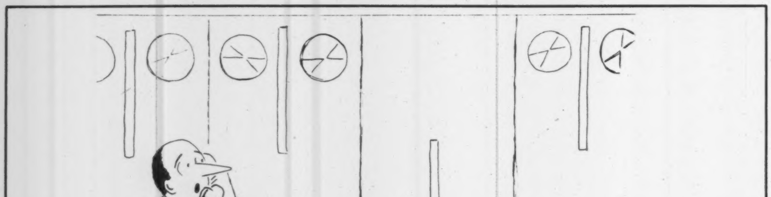
The search routine in *SuperScripsit* presents a menu with find/delete/replace choices. The program may be instructed to make searches independent of whether the string is in upper or lower case, or optionally will respect the case of the string. A search may be specified to locate only complete words which equal the string or to find the string even if it is embedded within a longer word. Searches are made from the cursor position to the end of the text file, and may be set to pause after each match to permit selective deletions or replacements or continue through the text uninterrupted.

Many of the functions of SuperScripsit are performed through block commands.

Many of the functions of *SuperScripsit* are performed through block commands. A block of text may be marked by moving the cursor to the beginning and then the end of the block, or by a Quick command which prompts for block identification by word, sentence, paragraph, printed page, from the cursor to the end of the text file. A block action command then presents a mini-menu from which a choice may be made to perform the block functions.

If the cursor is moved to a new position, Adjust gives the marked block the same format as the paragraph in which the cursor is located. Copy writes the block to disk and then duplicates it in the new location, while Move performs the move and also deletes the copy from the old position. Recall inserts the block from disk at the current cursor location, even if it was saved from a previous file. Print delivers a hard copy of the marked block, and Linespace alters the spacing of that block only.

Freeze makes the block impervious to change until it is unfrozen so as to preclude alteration if the text is later manipulated as part of a larger block. There is a Search option which functions like the global search but is confined to the marked block.



"I know you did a speedy installation — that's the problem!"

The Hyphen option brings the cursor to the segment of the word on the following line which would fit in the current line if hyphenated. The cursor can then be moved to the proper break point, and when a hyphen is struck, the word is broken and a hyphen inserted. The text is reformatted and the cursor moves on to the next hyphenation opportunity.

Other Features

A Control-C commands centering of the paragraph where the cursor rests, and whenever the cursor is moved over a centered paragraph, a Cen is displayed in the status line.

Text display may be toggled with a view mode to show the text as it will appear in print or to display format and print symbols as an aid in editing.

Ten user keys can be programmed to function with the control key in a sequence of up to 127 keystrokes each. A key sequence could, for example, insert a company letterhead or logo with a dot matrix printer, or type the complete standard signature block. The user keys can chain to one another and can loop back on themselves to provide such functions as scrolling.

SuperScripsit can be made to recognize widows so that the first line of a new paragraph doesn't end a page, or the last line of a paragraph hangs by itself at the beginning of a new one. When ordered to do so *SuperScripsit* will avoid widows by printing one more or one less line at the end of a page.

Headers and footers may contain up to 768 characters each. They may be identified to appear on odd, even, or all pages, and a menu option permits identifying the first page on which they will appear.

Printing

SuperScripsit has built-in functions to support the ability of the Daisy Wheel II to use sub- and superscripts, bold printing, strike-through, underscore, and double underscore. A top-of-form command sends reverse linefeeds equal to the number of lines printed on the current page to support two-column printing. Proportional or mono spacing or no justification at all can be specified, and the print pitch can be set to match the current wheel. Line spacing may be set for single to triple spacing with half-lines supported.

The printer menu permits commanding a page pause to insert a new sheet of paper at the end of each page. The program also supports a pause print command which can be placed anywhere in text to enable the operator to change daisy wheels before resuming printing.

SuperScripsit supports the Daisy

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Wheel II: Lineprinter IV, V, VI, and VIII; DWP 410, DMP 200, 400 and 500; and offers a general serial driver, as well. Several sample text files are provided on the disks to lead the new user through the lessons.

The CLEAR key is used to denote print codes embedded in the text, with the following character interpreted by the printer driver to activate the function. The *SuperScripsit* user can program both the shifted and unshifted number keys to operate in conjunction with the CLEAR key to send up to 20 sequences of special printer codes.

Menus

SuperScripsit calls up several menus to support user action such as opening a document, printing, or setting system parameters, and another pops up to offer options for Search. Seven screens of Help menus may be called in addition to the special Tab Help menu. Mini-menus appear for block actions, entering headers or footers, and Quick setting of line-spacing or margins. Most menus call for a simple response, but some require editing to establish new *SuperScripsit* default parameters.

Form Letters

SuperScripsit contains a file merge capability which allows inserting of data from a variables file into the text for form letter production. For example, if the program encounters /NAME/ in the letter it will insert the data from the NAME field in the variables file. One copy of the form letter will be printed for each record in the file. *Profile III* may be used to create variable data for merged form letters, or they may be written using *SuperScripsit*, with the variable field names entered as the first record.

Documentation

Both the Figures training book and the Reference Manual are tabbed for quick access, and both are clearly written. The reference manual contains a copy of the Daisy Wheel II printer driver source code as an aid to Model III users who need to write a driver for their own printers. Model I users will need a bit of experience to write a driver, as the differences are not defined.

The training manual, cassette instructions, and sample text files on disk provide a painless introduction to *SuperScripsit* operation. Even a beginner in word processing will find that the course makes learning word processing easy following the one-step-at-a-time format. Emphasis is on the Daisy Wheel II, however, and users of other printers will miss many of the finest features of the program.

Utilities

The program has a utility module to compress a *SuperScripsit* file to its minimum size, although there must be sufficient space on the disks to contain both versions simultaneously. Other utilities convert *SuperScripsit* files to ASCII and back again to retain compatibility with old *Scripsit* files and Basic programs saved with the A option.

The Proofread option uses the Scripsit Dictionary in a second drive on the Model III with a 73,000 word vocabulary. The Model I requires three drives and is limited to 34,000 words.

> ***Old habits of dealing with small segments and then combining them for printing will have to be changed.***

The Warts

The *SuperScripsit* text buffer holds nearly 12,000 characters, and the text file is written to disk automatically when the buffer fills or when the user is ready to terminate the session. For safety's sake, the user may empty the buffer to disk at any time. Since *SuperScripsit* writes the file to disk as it grows, the length of a document is limited only by disk capacity, and with a second Model III 40-track, double density drive that quantity is awesome.

Manipulation of very large files is possible, but can be a slow process when dealing with more than 12,000 characters. The user must wait for the text to be read from and written to disk even to move from one end of the file to another. Old habits of dealing with small segments and then combining them for printing will have to be changed, for there is no way to merge even two small text files. Smaller segments must be stored one at a time as a block and later inserted into a second file.

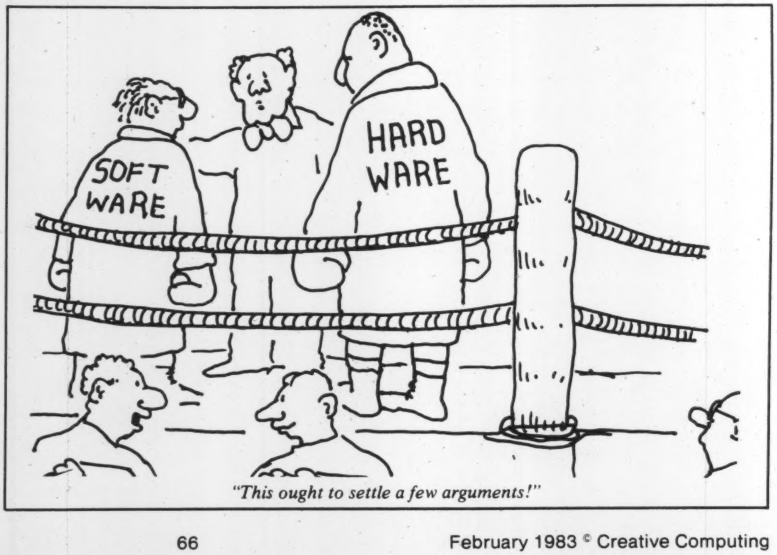
SuperScripsit must be used without a write-protect tab. TRSDOS will write marked blocks to drive 0 when identified for a move or copy, although text files may be identified to be written to other drives as a part of their file specification. The program has its own directory command. This is not supported on the Model I however, and my efforts to make *SuperScripsit* function with operating systems other than TRSDOS failed.

Surprisingly, three common features found in other word processors are absent: the program does not support keyboard entry during printing, nor does it allow chain printing of lengthy documents or support insertion of "boilerplate" or standard paragraphs from disk. The more versatile delete commands found in other programs would be a blessing.

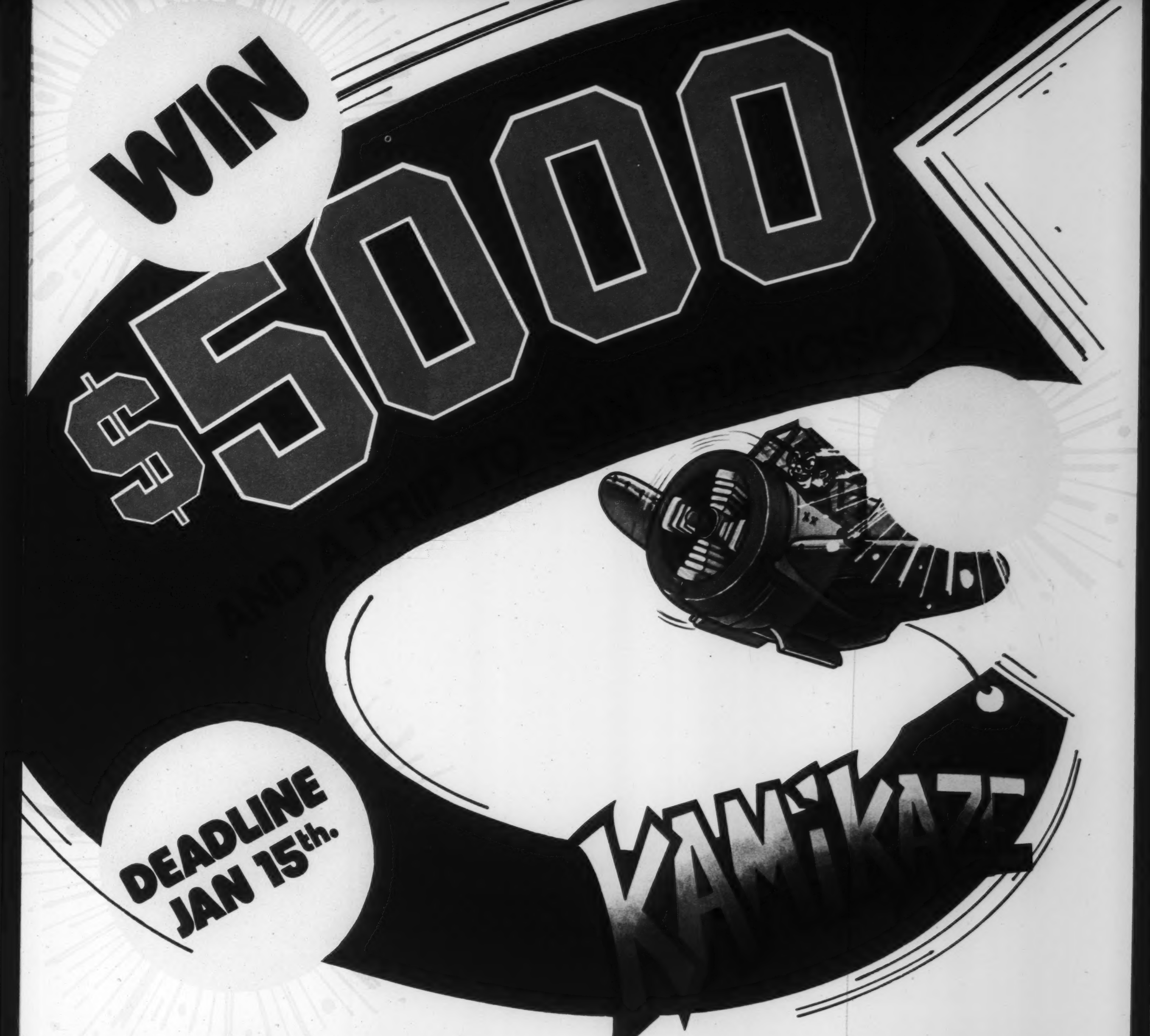
Summary

But that's being picky, for *SuperScripsit* does just about everything and does it very well, indeed. Users can be certain that Tandy programmers or outsiders will quickly have patch programs on the market to provide the few features that *SuperScripsit* lacks as well as the added utilities that are only now beginning to appear to enhance older word processors.

The program truly is *Scripsit* in a blue cape: it's *SuperScripsit.* ☐



"This ought to settle a few arguments!"



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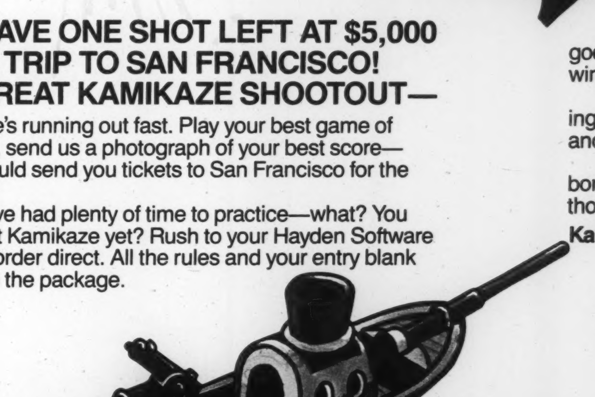

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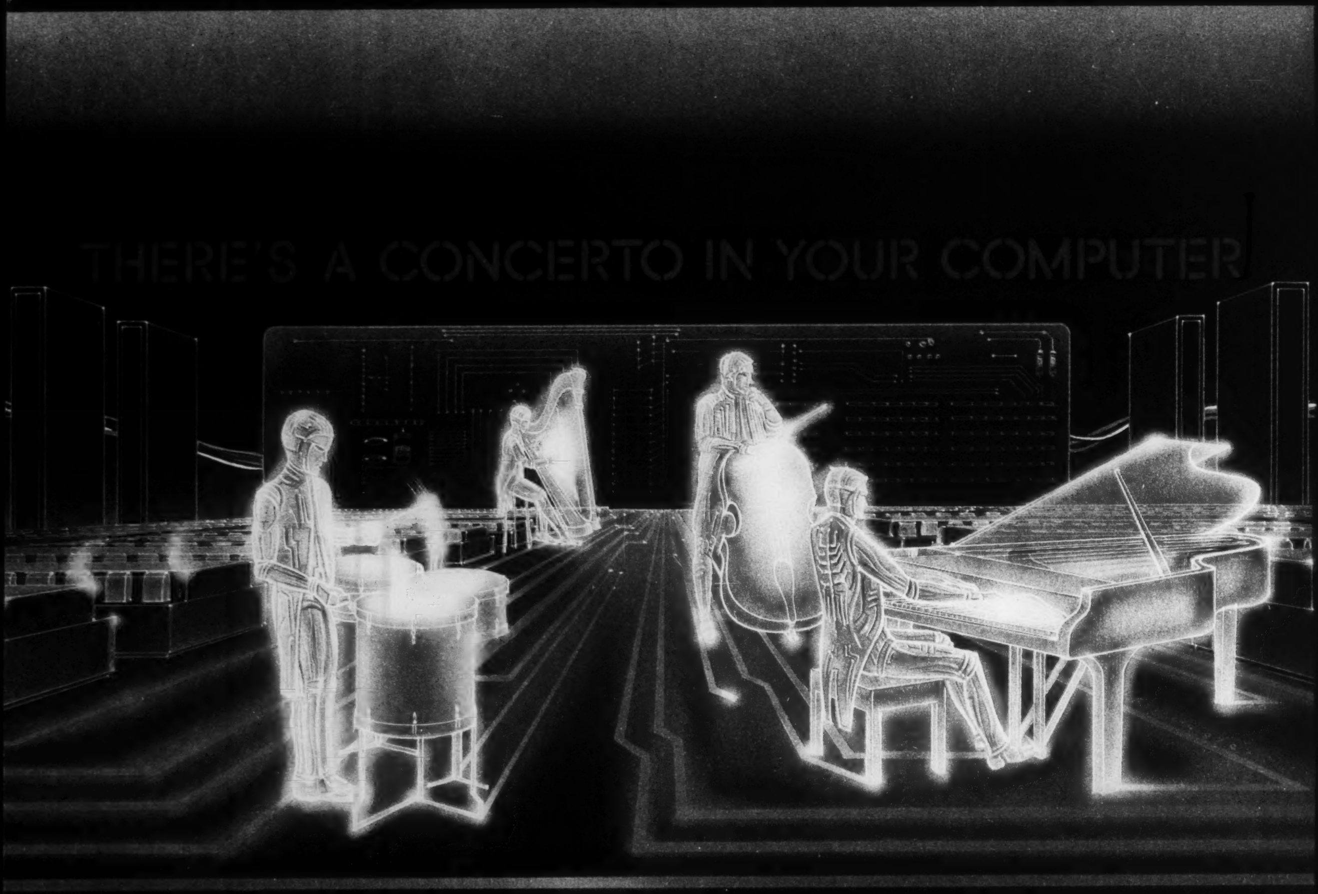

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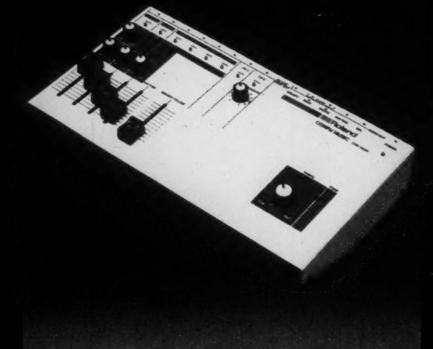

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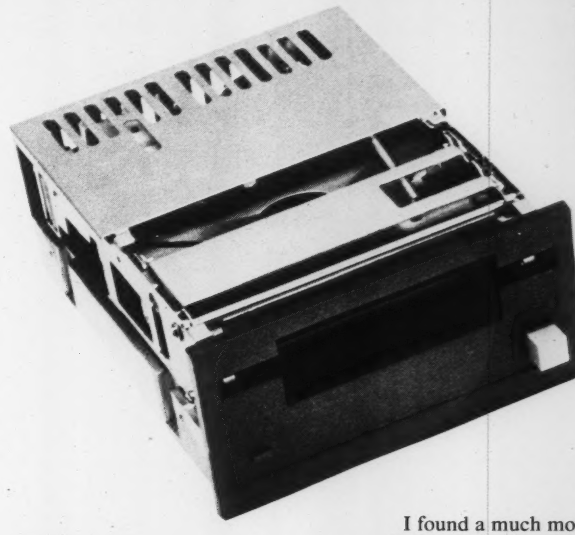


Interfacing A Really Mini-Floppy

Ancellme Roichel

Sony Corporation recently introduced its 3½" disk drive—thereby giving a new and significant meaning to the term "mini-floppy." In fact, Sony has coined the term "micro-floppy," to distinguish this remarkable new device.

The overall dimensions of the drive are an impressively compact 2" × 4" × 5". And yet, as I formatted them, I was able to obtain a storage capacity of 161K in the single density mode, 322K in the double density mode. The 3½" drive works identically to its older and larger precursors, with a couple of exceptions: head load, settling, and seek times are longer on the 3½" system.

Choosing A Format for Formatting

The manual accompanying the drive suggests the use of nine 256-byte sectors, or 16 128-byte sectors in formatting micro-floppy disks. This suggestion seemed to me rather arbitrary, and potentially wasteful. It is probably based on compatibility with certain equipment used at Sony.

I found a much more efficient manner of disk utilization through the definition of 18 sectors of 128-bytes per sector. Figure 1 indicates the formatting tables incorporated in the operating system.

Figure 2 indicates the disk definition tables for 16- and 18-sector formats. Interchange with other users and other disk media is possible through incorporation in the user's system software of the tables shown. They are based on the use of CP/M or a similar operating system.

```
.byte     ^d26      ;sec/trk 8 inch standard
.byte     0
.byte     ^d77      ;78 track 26 sector
.byte     2         ;number of sys tracks
.byte     0         ;future
.byte     ^d72      ;preamble


.byte     ^d11      ;gap 2
.byte     ^d27      ;gap 3


.byte     ^d18      ;18 sector Sony
.byte     0
.byte     ^d70-1    ;70 track micro disk
.byte     3
.byte     0         ;future
.byte     ^d16      ;preamble
.byte     ^d8       ;gap 2
.byte     ^d11      ;gap 3


.byte     ^d16      ;16 sector SONY
.byte     0
.byte     ^d70-1    ;70 track micro disk
.byte     3
.byte     0         ;future
.byte     ^d16      ;preamble
.byte     ^d11      ;gap 2
.byte     ^d27      ;gap 3
```

Figure 1. Formatting tables.

Sony Disk Drive, continued...

I have successfully interfaced the drive to S-100 bus computers, STD bus computers, and an Apple II, with Z80 card and Vista disk controller board. Interfacing the Sony drive to these three systems was completed without any serious problems. An interconnecting transition board must be furnished, and a software adjustment made to accommodate the head seek and settling times specified in the reference manual.

The interfacing signals required are extremely similar to those specified for 8″ Shugart drives. The major difference is that 8″ drives are usually connected via 50-conductor ribbon cable, while the Sony drive uses a 26-pin connector.

Another difference is related to the number of available drive select lines, and the method of turning the motor of the smaller drive on or off. Figure 3 shows the configuration of an adapter to resolve these differences. The use of such

```
For 18 sector/track single density:


SONY 18:


.word       ^d18        ;sectors per track
.byte       3           ;block shift factor
.byte       7           ;block mask
.byte       0           ;null mask
.word       ^d149       ;disk size - 1
.word       ^d63        ;directory max - 1
.byte       0C0H        ;alloc 0
.byte       0           ;alloc 1
.word       ^d16        ;check size
.word       3           ;track offset
.byte       3           ;stprat for microdrive
:
T18128
.byte       1,5,9,13,17,3,7,11
.byte       15,2,6,10,14,18,4,8
.byte       12,16
;

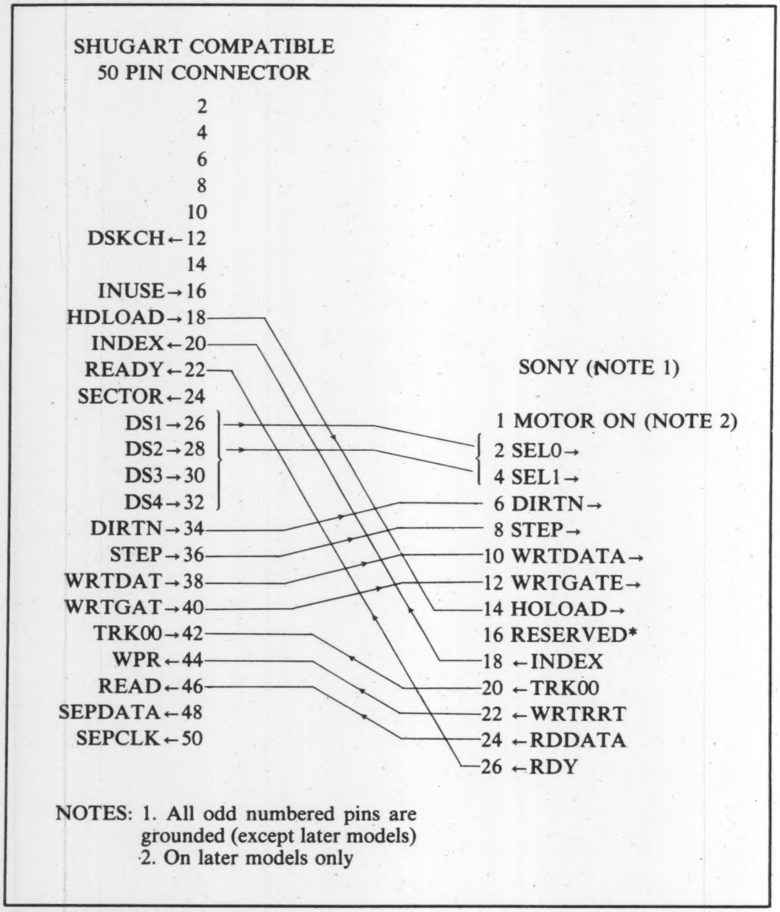

For 16 sector/track single density


SONY16:
.word       ^d16        ;sectors per track
.byte       3           ;block shift factor
.byte       7           ;block mask
.byte       0           ;null mask
.word       ^d133       ;disk size - 1
.word       ^d63        ;directory size - 1
.byte       0C0H        ;alloc 0
.byte       0           ;alloc 1
.word       3           ;track offset
.byte       3           ;stprat for microdrive
:
T16128:
.byte       1,6,22,26,5,20,15,4
.byte       9,14,3,8,13,2,7,12
:
:
```

Figure 2. Definition tables.

Performance Specifications

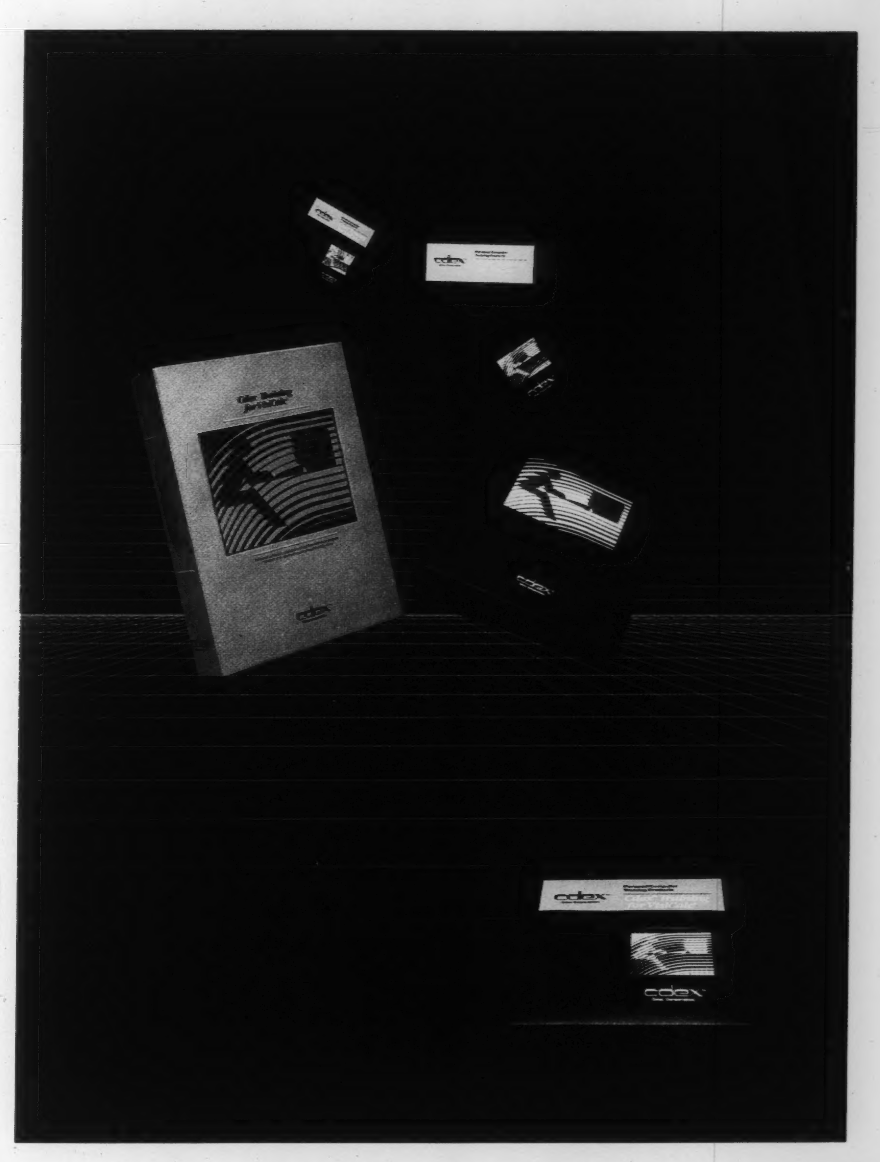
Capacity, Unformatted	
Single Density	218.8 kilobytes
Double Density	437.5 kilobytes
Capacity, Formatted (70 tracks, 18 sectors per track)	
Single Density	161 kilobytes
Double Density	322 kilobytes
Transfer Rate (600 R.P.M.)	
Single Density	250 kilobits/sec
Double Density	500 kilobits/sec
Access Time	
Track to Track	15 milliseconds
Average	365 milliseconds
Settling time	15 milliseconds
Head load time	60 milliseconds
Power Requirements	12 volts @ 400 milliamps, 5 volts @ 600 milliamps,
Power dissipation	7.5 watts continuous, 3.3 watts standby


SHUGART COMPATIBLE
50 PIN CONNECTOR
2
4
6
8
10
DSKCH←12
14
INUSE→16
HDLOAD→18
INDEX←20
READY←22
SECTOR←24
DS1→26
DS2→28
DS3→30
DS4→32
DIRTN→34
STEP→36
WRTDAT→38
WRTGAT→40
TRK00→42
WPR←44
READ←46
SEPDATA←48
SEPCLK←50
SONY (NOTE 1)
1 MOTOR ON (NOTE 2)
2 SEL0→
4 SEL1→
6 DIRTN→
8 STEP→
10 WRTDATA→
12 WRTGATE→
14 HOLOAD→
16 RESERVED*
18 ←INDEX
20 ←TRK00
22 ←WRTRRT
24 ←RDDATA
26 ←RDY

NOTES: 1. All odd numbered pins are grounded (except later models)
2. On later models only

Figure 3. Adapter configuration.

Cdex™ Training for VisiCalc® Makes VisiCalc Easy.



In an hour, Cdex Training for VisiCalc can make you a VisiCalc user. Or for the experienced VisiCalc user Cdex Training for VisiCalc acts as an instantaneous electronic reference and review system.

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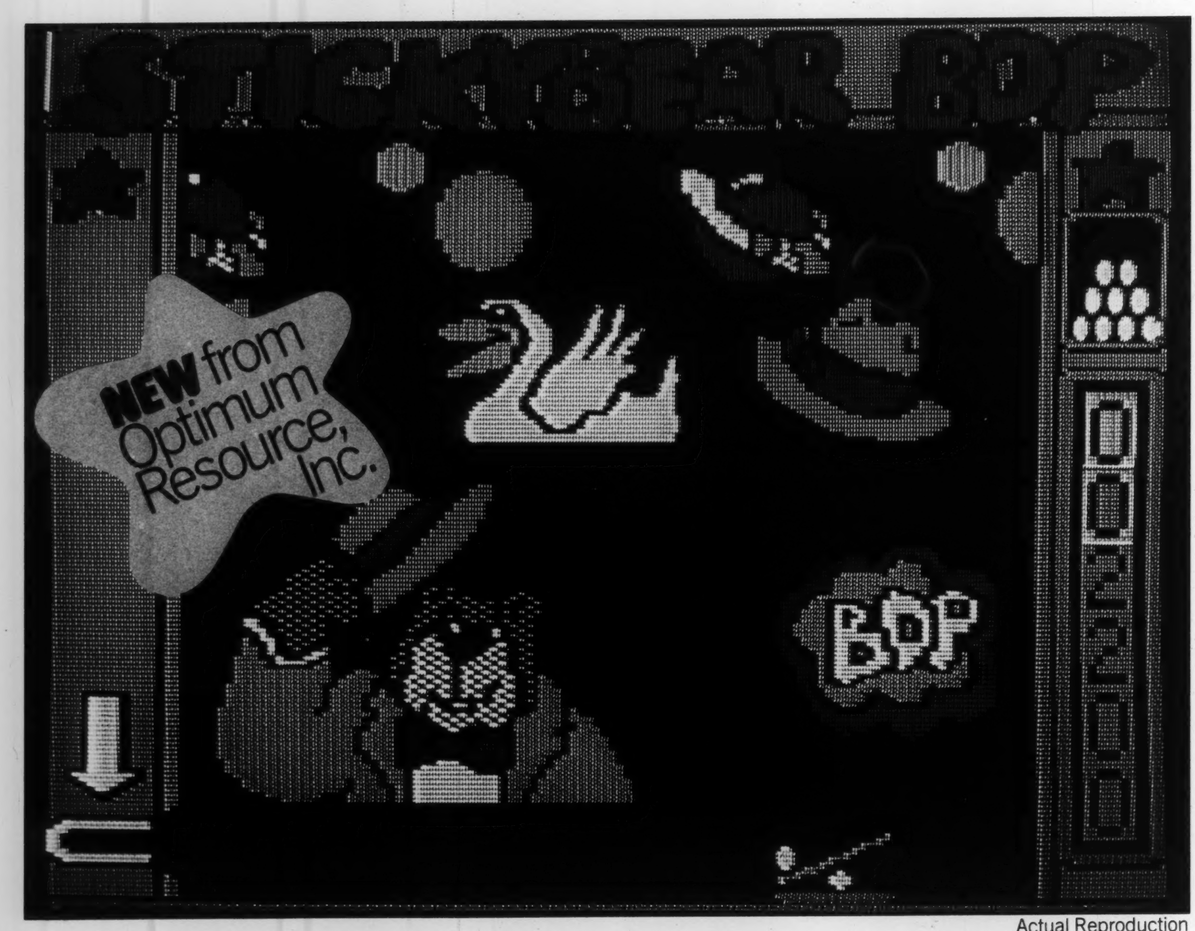
Introducing the most advanced computer animation ever created for the Apple®!


STICKYBEAR BOP
BOP

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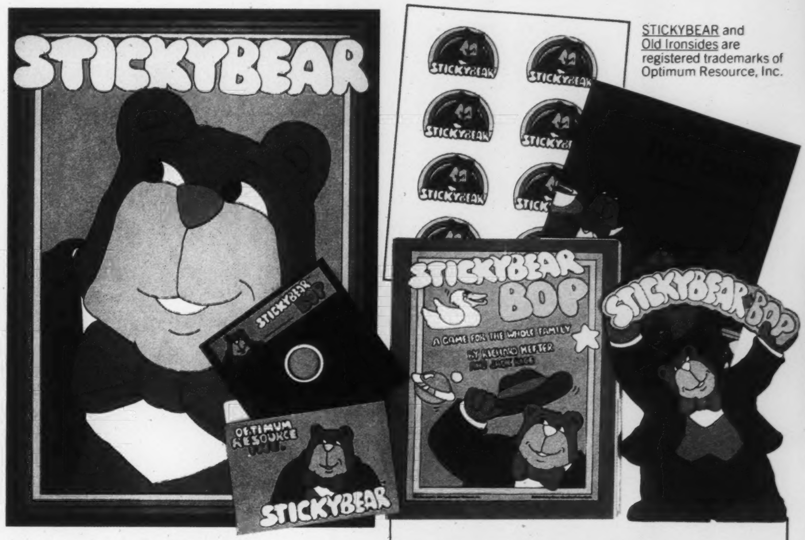
Actual Reproduction

"They told us that graphic animation this sophisticated can't be done."

–Richard Hefter, creator of STICKYBEAR and Old Ironsides and world-famous author and illustrator.



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It took 2½ years in testing and development, but we've finally done it! Announcing a breakthrough in color graphics that will put the most advanced computer animation at your fingertips!

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If there is no store near you, Visa and MasterCard holders may order by calling toll-free 1-800-852-5000. Or, send a check or money order for $39.95 for each program, plus $2.00 for shipping and handling (and please add state sales tax). Mail to Xerox Education Publications/ Weekly Reader, Dept. 3-A, 245 Long Hill Road, Middletown, CT 06457.

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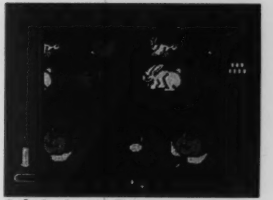
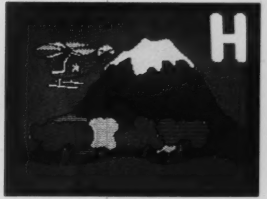


Stickybear Bop

Three animated shooting galleries of STICKYBEARS, ducks, planets, balloons, more...to knock off the screen. Each round requires more skill. FREE game, poster and stickers. For ages 3 to 99.

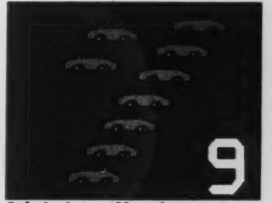
By Richard Hefter. Program by Jack Rice.



Stickybear ABC

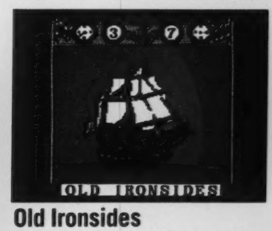
Big, full-screen full-color moving pictures, with sound, represent each letter in the alphabet. FREE poster, book and stickers. For ages 3 to 6.

Pictures by Richard Hefter. Program by Jamie and Steve Worthington and Spencer Howe.



Stickybear Numbers

Colorful groups of big moving objects – trucks, ducks, planes, more – teach numbers, counting and simple arithmetic. FREE poster, book and stickers. For ages 3 to 6. Pictures by Richard Hefter. Program by Jamie and Steve Worthington.



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This colorful, new 2-player naval battle features animated sailing ships firing broadsides at each other. Tactics include ramming, shooting out the opponent's ammunition and hiding in fog...while contending with wind direction, clouds obscuring your vision, more! FREE poster. For ages 8 to 99.

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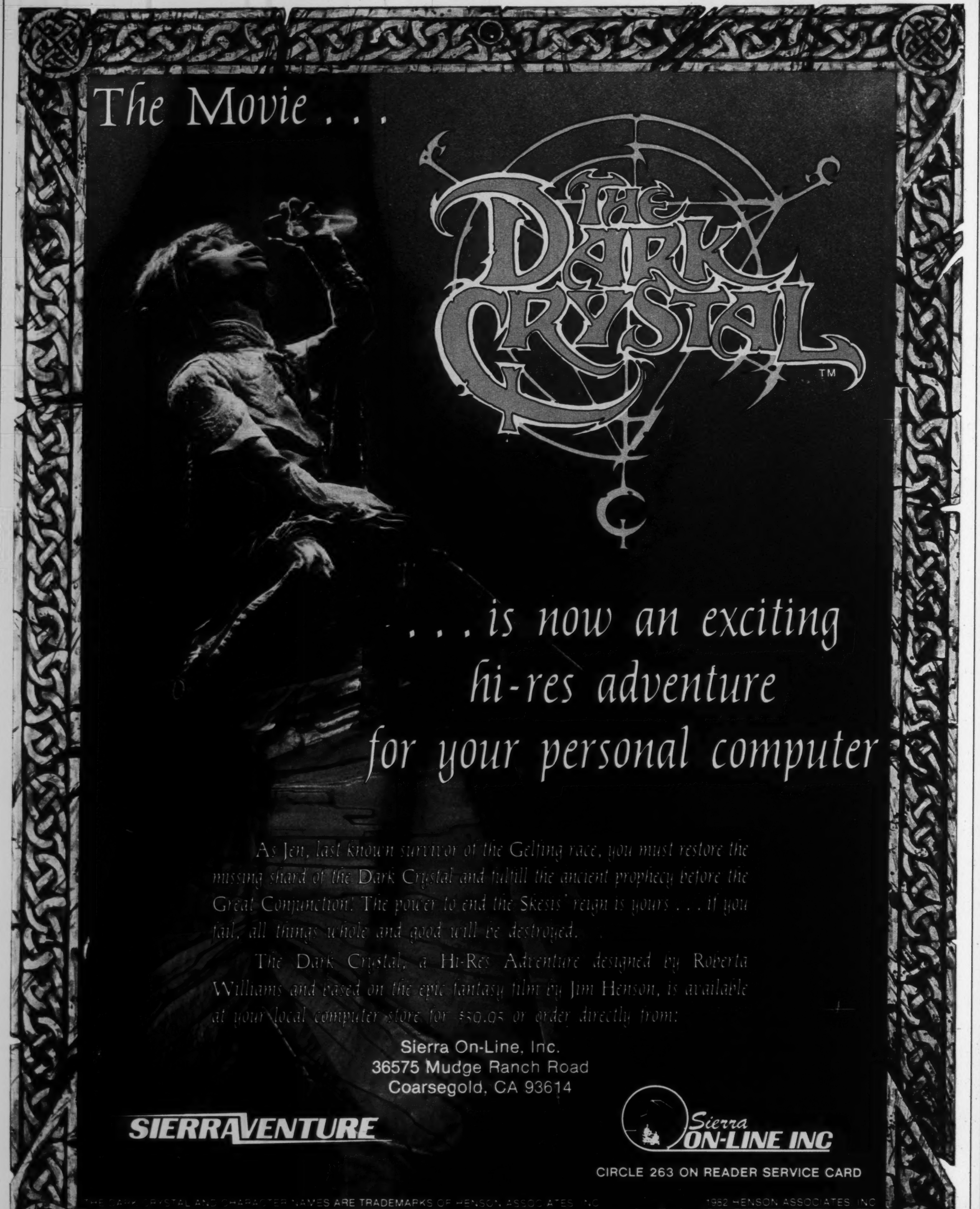

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THE DARK CRYSTAL™

. . . is now an exciting hi-res adventure for your personal computer

As Jen, last known survivor of the Gelfing race, you must restore the missing shard of the Dark Crystal and fulfill the ancient prophecy before the Great Conjunction! The power to end the Skesis' reign is yours . . . if you fail, all things whole and good will be destroyed.

The Dark Crystal, a Hi-Res Adventure designed by Roberta Williams and based on the epic fantasy film by Jim Henson, is available at your local computer store for $39.95 or order directly from:

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THE DARK CRYSTAL AND CHARACTER NAMES ARE TRADEMARKS OF HENSON ASSOCIATES, INC.

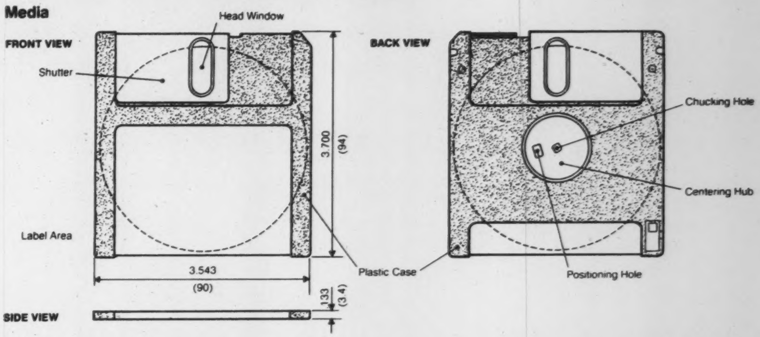
1982 HENSON ASSOCIATES, INC.

The Great Micro-Floppy Case

Of particular interest is the Sony micro-floppy disk casing.

The rotating medium itself is very well protected, so that the diskette is much less prone to damage than 5¼" or 8" floppies. The disk cover is made of rigid plastic which incorporates a sliding aluminum cover to protect the head window when the diskette is not in use. The center hole is reinforced with a heavy duty aluminum hub.

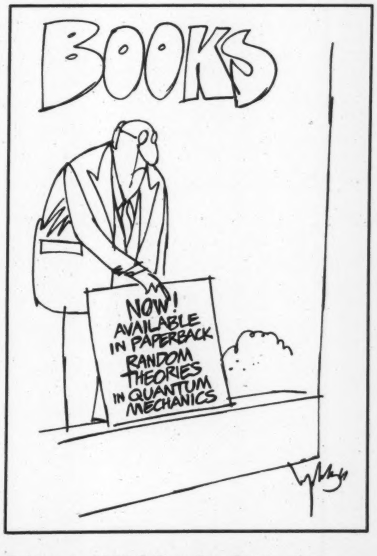
While these improvements result in added cost to the disks, they totally eliminate the need for disk sleeves, and produce a much more durable diskette overall. Spills, bending, and cruel treatment during shipment pose a minimal threat to micro-floppy data.—JJA



a board permits the intermixing of 8" and Sony drives in the same system, and on the same drive interconnecting cable.

I have been using the drive for several months with no more problems than are usually encountered with disk drives. Although the cost of the drive is as high right now as that of a comparable 8" unit, that will probably change very soon. Its construction and design suggest a drastic decrease in this cost as more users incorporate the drive into their systems.

A recent contact between Hewlett Packard and Sony for approximately $30 million worth of drives may also indicate a rapid price decrease. It may well be that the micro-floppy drive will soon supplant its older and larger cousins as the *de facto* storage medium of microcomputers. ☐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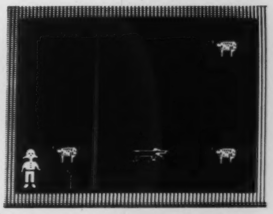
Classic Family Software ™ Introduces

Micro Mother Goose

Fun Games For Kids

At last, arcade quality games for kids. Imagine your children laughing with excitement as they too join in video fun. No reading required to operate. "The first computer activity my four year old daughter really enjoyed."



3 fun-filled Mother Goose games start easy for the little ones, but challenge all at higher levels.

Musical Computer Comics

Enjoy good feelings with your children as you read and sing popular Mother Goose rhymes together. Complete illustrated parents manual provided.

```
Little Miss Muffet sat on a tuffet
Eating some curds and whey
Along came a spider
Who sat down beside her
And frightened Miss Muffet away
```

9 magical Mother Goose rhymes are so easy to run even 3 year olds can operate successfully.

Free Stickers & Poster

Your kids will love their color Mother Goose stickers. And the large color "Micro Do's and Don'ts" poster shows the "rules of the road" for happy and safe family computing.

Ask For It... At Your Local Store

Don't wait. Take this ad to your local computer store today and get your kids "Micro Mother Goose."

Graphics created with The Graphics Magician

Apple II is a Trademark of Apple Computer, Inc.

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No waiting. Now with Microfazer by Quadram there is no more waiting.

Microfazers are inexpensive universal printer buffers which any computer user cannot afford to be without. Any computer—any printer (or plotter!), whether parallel or serial. Microfazer receives information from the computer at ultra high speeds causing the computer to think the printer is printing just as fast as the computer can send. Microfazer holds the information until your printer can handle it, and then sends it on.

More copies. Microfazer is equipped with a copy feature allowing additional copies of the buffered information—from one to as many as you want—with the mere press of a button. When you need your information repeated, for whatever reason, it's always right there—inside Microfazer.

Microfazer™ stack. Microfazer can be stacked with popular modems or other peripherals. Some models can plug directly onto the back of your printer. Install it in less than 60 seconds, and choose the amount of buffer memory you need—8K, 16K, 32K, or 64K. One model even comes with up to 512K! You may use several Microfazers in series to create just what's right for you. Take data in from a serial computer and out to a parallel printer. Or in from a parallel computer and out to a serial printer. Microfazer is just as flexible as you need it to be.

Low price. Only $169 for 8K of buffering, $189 (16K), $225 (32K) and $299 for a full 64K. Serial-to-Parallel, Parallel-to-Serial and Serial-to-Serial models have slightly higher prices.

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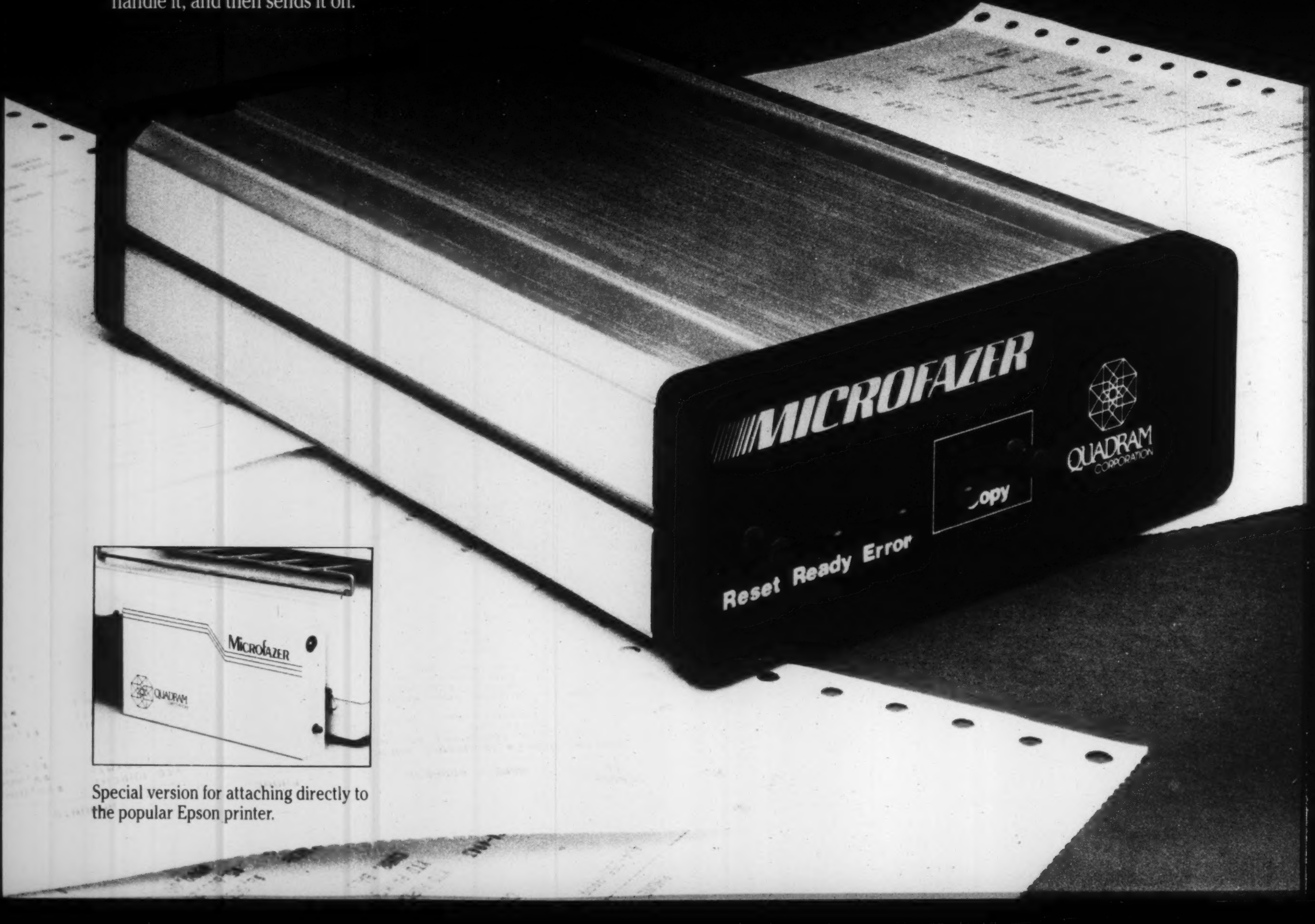
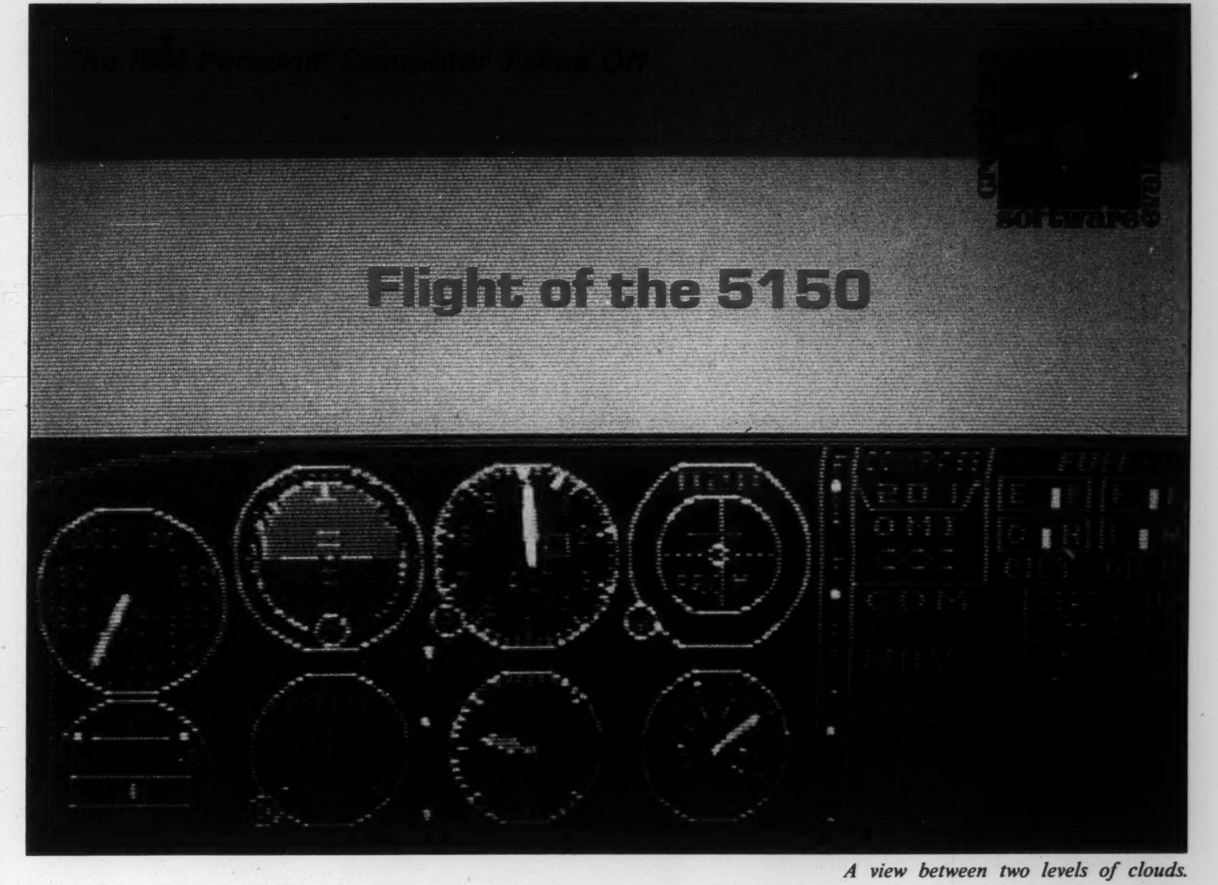


Special version for attaching directly to the popular Epson printer.

The IBM Personal Computer Takes Off

Flight of the 5150



A view between two levels of clouds.

Will Fastie

By the most remarkable of coincidences, I find myself in Chicago with some time to myself. I've just recently heard that Microsoft is about to introduce a flight simulator for the IBM Personal Computer, and that the program is being written by Bruce Artwick. What luck! I'm only a short hop from Champaign, the home of Bruce and his company, Sublogic.

My luck holds. It is a beautiful day for flying, and my friends Alan and Tandy offer to lend me their plane. It's gassed and waiting at Meigs, they tell me, so I'm off. Sure enough, I find it without difficulty.

Of course, I find it a little peculiar that the aircraft is sitting in the middle of the runway with the engine running, but I climb into the cockpit and begin my checkout. Let's see, fuel tanks full. Radios on and working. Magnetos both. Engine sounds smooth, temperature and pressure coming up. Visual check out all windows, okay. Control surfaces working properly.

The plane is sitting on the runway facing north, but I'm a little too close to the northern end for my comfort. I like a lot of runway. There's nothing going on around me, and no visible traffic, so I apply a little throttle and turn hard to the left. I'm off, a slow taxi to the southern end of the runway.

The radios are set for Willard Airport, but I decide to cruise at 5000 feet, which puts the VOR (VHF omni-directional radio) at Willard out of range. So I reset the NAV (navigation) radio to 113.2 MHz (megahertz), the Peotone VOR. I also tune the COM (communications) radio to 123.0 MHz, the frequency of the Greater Kankakee Airport control tower. If my navigation is any good, I'll pass just to the west of this airport after I fly over the Peotone VOR. With the frequency set, I immediately hear a report which, except for weather conditions, I ignore.

Ah. I'm at the southern end of the runway. Hard left, line it up due north. Flaps up, full throttle, and I begin the roll. Oops, due north isn't quite right; nudge it a little west, that's good. Now the speed's picking up, looks good, airspeed about 70, plenty for takeoff. Ease back the stick, hold it for a second, and I'm off!

Landing gear up. That's funny, I still see a wheel under my left window when I look down. Hmmm. Now I put the stick forward just a tad and the plane picks up speed. At full throttle, I begin a rapid climb. I sneak a quick glance over my shoulder to watch Meigs slip away, and I take an extra moment to take a snapshot (see Photo 1). The John Hancock building looms up to my left, and I begin a left turn to head south.

Golly, that's a neat building from the air. I decide to fly around it for a full view. I bank right toward the eastern side of the building, then I bank left to head around it counter-clockwise. Ah! Perfect view, another snapshot (see Photo 2). Is that somebody in the building waving at me? Hard to tell. Just my imagination, I guess.

Enough foolishness. I hold the left bank. I'm at about 2000 feet and climbing now. I flip the OBI (omni-bearing indicator) until I find a course toward

---

W. H. Fastie, 7110 Sheffield Road, Baltimore, MD 21212. Correspondence can only be acknowledged when a stamped, self-addressed envelope has been provided.

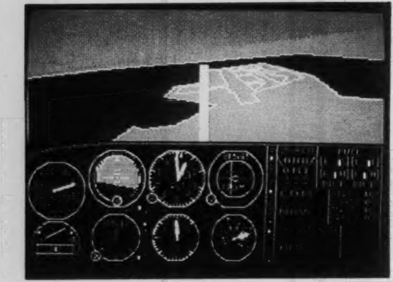


Photo 1. View out the rear window as I leave Meigs Field.

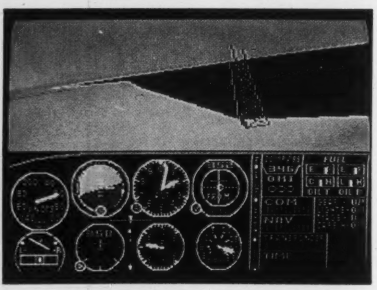


Photo 2. I decide to circle around the Hancock Building.

Peotone. There it is; I head southwest, course 190. Off to my right is the Sears Tower, and there is Chicago-Midway coming into sight. That's about the last landmark I know in Chicago, so I concentrate on getting the aircraft into a stable configuration.

As I pass through 3000 feet, I ease back the throttle to about 75% and return the stick to almost center, just a little back. I'll keep climbing, just a little slower. I pick up a little forward speed. A glance at the OBI and my compass confirms that I'm on course.

At about 4800 feet I throttle back to 65% and begin to level off. I continue to climb about another 100 feet, and then I level. That looks okay, so I begin to get ready for my first course change.

I pull out my chart. I decide to fly from Peotone to the Roberts VOR, then maintain that course until I intercept the 170 bearing from the Champaign VORTAC. I'll then turn left, and I should find myself heading directly for the Willard runway.

Aha. The OBI changes from TO to FROM, indicating that I've just passed over the Peotone VOR. NAV frequency to 116.8, Roberts. Spin the OBI, looks like 210 will do it. I gently bank to the right until I'm heading that way. There's greater Kankakee in the distance, just a little to my left. That's really the last landmark I can identify before I get to Champaign.

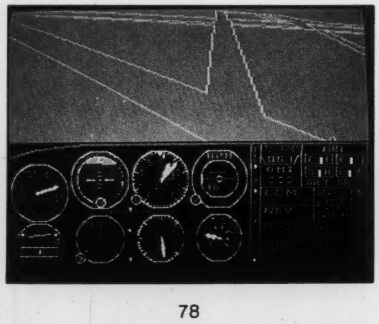
The aircraft is doing well. Plenty of fuel, although it is somewhat lower than I expected. Let's see, the endurance of the plane is supposed to be 7.5 hours at 65% throttle, but I climbed under full power for a while. Still, both tanks register half full after only 30 minutes of flying. Maybe I've got a leak. I hope I make it.

The OBI flips from TO to FROM, and I know I've just crossed Roberts. NAV goes to 110.0, and I begin to watch the OBI for bearing 170. Shouldn't be too long—there it is! I turn left to heading 170.

Now I begin a gradual descent by throttling back to about 25%. The plane drops very slowly. Willard is not in sight yet. Check the chart; Willard altitude is 754. There it is! Altitude is now 3000, and I continue my glide. The airport is getting closer now, but I'm too high. I inch the stick forward, and I drop a little faster. 2000 feet now, so I give 10% flaps and inch the throttle back up to 50%. Stick forward to keep the glidepath. I've got a better view of the airport now, but I'm not lined up for the runway like I had planned. I begin to adjust my course to line up. 1500 feet, landing gear down. A little carburetor heat just in case. 65% throttle, 20% flaps. The runway is in front of me now, but I need further adjustment to line up. 1000 feet, about 80 knots, looks good. Oops, I'm over the runway at 1000 feet, or 246 feet above ground level (See Photo 3). I inch the stick forward to drop a tad faster. There we go. 900. 800. Full flaps. Ease the stick back. I'm not stalling, but I'm not going down! Stick forward, that's better. I sink, cut the throttle, ease back the stick, and hear the wheels hit the ground. I'm down!

Both my tanks have been hit from behind. Curse you, Red Baron!

Photo 3. My final approach to Willard Airport.



Hold it now. Stay on the runway, look for the taxiway. Apply some brakes. There it is. Off the runway. More brakes. Oh, heck, stomp on the brakes. The plane stops.

And I stop to catch a breath.

Okay, I'm here. I start to look for Bruce Artwick. He must be around here somewhere. I taxi all around the airport, but no luck. No other planes in sight. You mean I flew all this way and he's not around? I'm crushed.

Change of Scenery

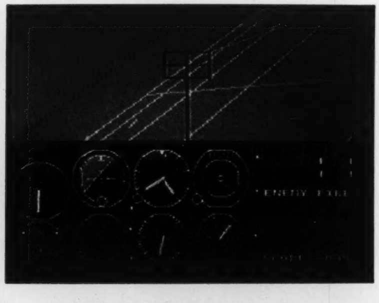
I sure don't feel like flying back to Chicago, but I guess I don't have any choice. Here we go. Visual check OK. Radios OK. Fuel tanks topped off. Huh? How'd that happen? Wait a minute, where am I? This doesn't look like Willard. Hold it. The instruments are different. And those indicators. Ammo? Bombs? Hey, what gives?

I'm a little scared. I feel safer in the air, so I hit the throttle and head for the runway. Oh no, forget the taxi: I'm doing this under power! There's the speed, and I'm up. I decide to climb fast so I can get a better look at where I am.

Hmmm. Big river ahead. Is that an airport in the distance? Funny, the gound looks like graph paper. Wait! What's that ahead? Looks like some other aircraft. Can't make them out, though; they're too far away. I think I'll land at that airport and see if I can find someone to tell me where I am.

That's funny, those are biplanes. Wait a minute! They're Fokkers! I click off a picture (see Photo 4) in case somebody doesn't believe me. Holy smokes, they're shooting at me! I fire back. I'm a bad shot, and I miss. There's one, right in my sights! I fire! A *hit!* Uh oh. My fuel gauges are dropping, and fast. Both my tanks have been hit from behind. Curse you, Red Baron!

Photo 4. The British Ace War Game. Three biplanes are visible out the front window.



GEMINI–
FOR PRINTER VALUE THAT'S OUT OF THIS WORLD

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

The Gemini 10 has a 10″ carriage and the Gemini 15 a 15½″ carriage. Plus, the Gemini 15 has the added capability of a bottom paper feed. In both models, Gemini quality means a print speed of 100 cps, high-resolution bit image and block graphics, and extra fast forms feed.

Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, backspacing, double strike mode and emphasized print mode. Another extraordinary standard feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

Gemini reliability is more than just a promise. It's as concrete as a 180 day warranty (90 days for ribbon and print head), a mean time between failure rate of 5 million lines, a print head life of over 100 million characters, and a 100% duty cycle that allows the Gemini to print continuously. Plus, prompt, nationwide service is readily available.

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CIRCLE 271 ON READER SERVICE CARD

I'm at 2000 feet, and I look frantically for a place to land. I'm only a couple of miles from friendly territory--maybe I can make it. I start to turn toward home. I'm hit again! I begin to bank hard to the left. I yank the stick to the right, but I'm out of control. I'm spinning! Calmly, I salute the victor. I'm going down fast! Arrrgh....

Now For A Snack

It's been an exhausting two hours. I get up, stretch, and head for the kitchen for a snack. Let's see, Coke, munchies, and back downstairs. Get my notes, and reboot the computer.

That's right. For the last two hours the Microsoft *Flight Simulator* has let me fly from Chicago to Champaign and let me do battle with six German fighters of World War I vintage. And that's only a preview of the capabilities of the program.

Written by Bruce Artwick (see box), the program is described by Microsoft as "a second generation, real-time flight simulator" for the IBM Personal Computer. Requiring a 64K system with a disk drive and a Color/Graphics Adapter (with any kind of display device), the simulator provides an extraordinarily realistic simulation of the flight of a single engine light aircraft.

Visually the product is exciting. Half the screen is devoted to a detailed rendition of an aircraft instrument panel. The standardized instruments (airspeed indicator, artificial horizon, altimeter, turn and bank indicator with two-minute turn marks, gyrocompass, and rate of climb indicator) are included in a cluster on the left side. An omni-bearing indicator (OBI) and an engine RPM gauge are in the approximate center. On the right is the radio stack with COM and NAV radios and a transponder. A digital clock, magnetic compass, ILS marker indicators, fuel gauges, and oil temperature and pressure gauges are provided. Indicators for the instrument panel lights, carburetor heat, magnetos, and landing gear are at the far right. Scattered around the panel are indicators for flaps, elevators, elevator trim, rudder, ailerons, and throttle.

The out-the-window display is stunning. The pilot has a 360-degree field of view through eight "windows." The pilot can also look out his window (left side of aircraft) for a downward view. The display is done in color. The ground is green, water blue, sky light blue, and clouds white and gray. Photo 4 shows the view out the front window when the aircraft is between the two cloud layers. Airports are white outlines on green. When the aircraft is moving, the animation is fantastic. Microsoft claims 15 frames per second which is, of course, the same speed as home movies and half the speed of video tape. The motion of the "world" and the objects in it is very smooth.

The world is very big. It is a square 10,000 miles on a side. The database used to represent the world has a resolution of 2.5 inches, that is, the distance from a coordinate in the system to one of its immediate neighbors is 2.5 inches. North America fits easily into the database.

After the terrific display graphics, the next best feature, but the most important for the product, is the contents of the database. Five major areas of the United States are included with the product: Seattle, WA (near the home of Microsoft), Los Angeles, CA (including Catalina), Chicago, IL (extending far enough south to include Champaign, home of the program author), Boston, MA., and New York. Altogether, there are about 22 airports and 38 VORs. Recognizable landmarks, such as the Sears Tower and Hancock Building in Chicago, are included in each area. Everything is in its place; the "world" is geographically correct.

The Parameter List

These cities are too far apart to fly between, although New York to Boston can be managed. Since the simulator always comes up with the aircraft at Meigs, an editing mode is provided to let you change a long list of parameters, including your position. It is easy to move from Boston to Los Angeles in just a few seconds.

But those parameters do much more. The first one on the list is called the *mode.* There are 50 modes, with 0 through 9 preset with the program and the rest available for modification by the user. Selecting modes 0 through 9 causes the rest of parameters (or at least those needed) to be automatically set. The other 40 modes are empty, and can be written with any settings desired.

The parameter list includes settings

The Genius of Champaign-Urbana

Bruce A. Artwick, 29, is the president and founder of Sublogic Company, known primarily for its graphics systems for the Apple computer, and particularly for the *A2-FS1 Flight Simulator* for the Apple. More recently, Sublogic has published Bruce's pinball game, *Night Mission,* for the Apple.

Bruce received his bachelor's and master's degrees in electrical engineering from the University of Illinois at Champaign-Urbana. Not surprisingly, his master's thesis is entitled "A Versatile Computer-Generated Dynamic Flight Display." The thesis work was performed at the Aviation Research Laboratory, Institute of Aviation, University of Illinois for the Office of Naval Research.

Bruce can fly for real, too. He received his private pilot's license in 1975, and lists flying as a hobby along with motorcycling, skiing, music, and volleyball (provided it's on a sandy California beach). He used to be in a rock band, and currently plays electric piano and various synthesizers.

In 1976, after he graduated, Bruce went to work for Hughes Aircraft in Culver City, CA. There he designed logic and chips for high performance signal processor computers. He started Sublogic while at Hughes, saved some money, and in 1979 moved back to Illinois "where," he says, "the crowds are thin, the air is clean, and the seasons are noticeable."

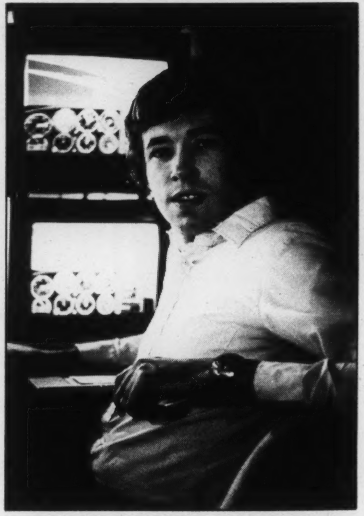

Photo 6. Famous Person Bruce Artwick.

In the midst of the Sublogic success, Bruce found time to write *Microcomputer Interfacing,* published by Prentice-Hall. Prentice-Hall is soon to release Bruce's second book, *Microcomputer Graphics.* However well the first book did, the second is sure to fly!

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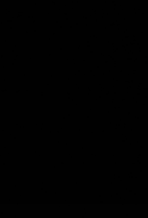

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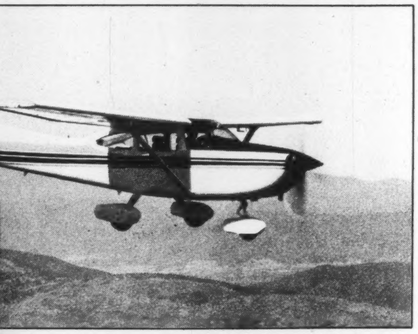

Photo 7a. Cessna Skylane, also known as the Cessna 182.

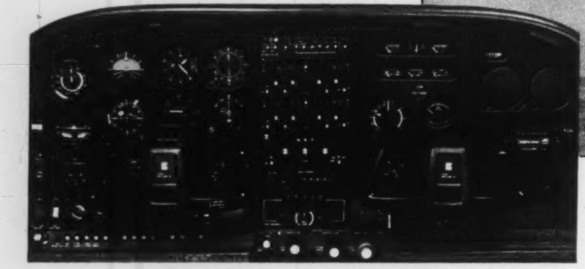

Photo 7b. Instrument panel of the Skylane.

One of the things I wondered when I began to follow the development of this product was which aircraft was being simulated. I was certain that it would be real as opposed to imaginary, and this turned out to be true.

According to Microsoft, the aircraft is "very close" to a Cessna 182. So I called Cessna and got the specifications and some pictures. Cessna calls the model the Skylane, and it is shown here. I also got a picture of the instrument panel, which bears a striking resemblance to the simulator.

The meat of the comparison, though, is in the performance specifications. Here they are. You be the judge.

Item	Simulator	Skylane
Length	28′	28′
Height	9′ 3″	9′ 3″
Wingspan	36′	35′ 10″
Wing Area	174 sq. ft.	174 sq. ft.
Landing Gear	Retractable, nose steers	Non-retractable, nose steers
Maximum Takeoff Weight	3100 lbs	3100 lbs
Empty Weight	1752 lbs	1730 lbs
Maximum Useful Load	1360 lbs	1380 lbs
Maximum Landing Weight	3100 lbs	2950 lbs
Wing Loading	17.8 lbs/sq.ft.	17.8 lbs/sq.ft.
Power Loading	13.2 lbs/HP	13.2 lbs/HP
Maximum Useful Fuel	88 gals 526 lbs	88 gals 526 lbs
Max. Rate of Climb, Sea Level	1050 ft/min	865 ft/min
Max. Rate of Climb, 8000 ft.	455 ft/min	———
Service Ceiling	14,900 ft.	14,900 ft.
Maximum Speed	146 knots	146 knots
Cruise: 65% power at 8000 ft.	133 knots	
75% power at 8000 ft.		142 knots
Endurance: 65% power	7.5 hours	
75% power		5.9 hours
Stall Speed: Clean	54 knots	54 knots
Flaps Down	49 knots	49 knots

for two layers of clouds and three layers of winds. If these settings are ignored, the day will be clear and without wind. The time can be set, for day, dusk, or night flight. The season of the year can be selected, which affects the time of the day dusk and night fall.

The state of the aircraft is completely represented by a set of parameters in the list. Pitch, heading, altitude, airspeed, throttle position, rudder position, and elevator position can all be set by entering the appropriate values.

The last item on the parameter list is the reliability factor. If this factor is reduced from 100, then a possibility exists that the aircraft could develop some kind of trouble during the flight.

The default mode is O, called "Easy Flight." It has some characteristics which make flying easier and is especially designed with the novice in mind. One feature is called auto-coordination. When this feature is engaged, the ailerons and the rudder move together, and the aircraft is easy to steer. Another feature, reality mode, is off. This keeps the engine running all the time, causes empty fuel tanks to be ignored (you can still fly), prevents the heading indicator from drifting, and keeps the instruments visible, even at night with the lights off. When reality mode is on, these factors and others contribute to increased complexity in the simulator.

The ten preset modes provide a number of flying situations.

The ten preset modes provide a number of flying situations. There is one mode each for fair, moderate, and bad weather flight. Dusk and night flight each have a preset mode. Two modes are dedicated to airborne situations, one normal and one emergency. The British Ace game is started by selecting mode 7.

The only part of the simulation which is not particulary realistic is the way in which the controls are implemented. Of course, there is no control yoke. All controls are on the keyboard. Once learned, however, they are not difficult to use. The stick takes some practice: there is a tendency at first to think that the "up" and "down" cursor keys mean just that, when in fact they mean "stick forward," which makes the aircraft nose down, and "stick back," which makes the aircraft nose up. If auto-coordination is removed, the rudder must also be controlled.

The function keys on the left of the keyboard are used for flaps (the odd keys) and throttle (the even keys).

The letter keys are used for just about everything else. The landing gear switch is G, magnetos M, carburetor heat H, etc. The three radios can be set with C, for COM, N for NAV, and T for transponder. The OBI is set with V for VOR. D resets the gyrocompass, and A sets the altimeter for the current barometric pressure. In British Ace, X drops a bomb, W declares war, and the spacebar fires the machine guns.

The program provides another system for helping the pilot locate the position of the aircraft. It is a radar system which displays a top down (bird's eye) map-like image. I have found it most helpful in two cases. It is invaluable for taxiing around an airport. When you look out the window while on the ground, your perspective is not good and it is hard to see a taxiway, for example. The radar map shows your position clearly. The second case is flying into an airport with which you are unfamiliar. The radar view can give you a sense of the runway layout before the airport is visible out the window. This allows you to get into better position.

Some runways at some airports have an ILS beacon. However, the version of the program I was testing did not have this feature. When complete, the ILS will allow very accurate positioning.

Well, all that sounds very complicated, and it is. The manual that comes with the simulator is over 100 pages long and inclues aeronautical charts (accurate, but for use with the simulator only), an excellent glossary of terms, good diagrams, and a big section on how to fly. I felt one thing was missing: although area charts were provided, I thought that the more detailed approach charts or airport diagrams would have been useful so that runway headings could be known. Since the world in the simulator is accurate, it should be possible to buy commerically available charts for this purpose if you feel it would help. With that exception, the manual is excellent.

And even though the program is complicated, it can be enjoyed quickly. As you grow more proficient, you'll be able to handle greater and greater complexity. The program lets you dole out the complexity in dribs and drabs, at your pace.

Summary

It's not hard to summarize my feelings about this program. In their established tradition, Microsoft has again chosen to market a classic program, unique in the market. The program is extensive, and the aircraft simulation is realistic. The graphics are outstanding. British Ace alone is a considerable advancement over Mr. Artwick's previous effort, the *SubLogic Flight Simulator* for the Apple and TRS-80 (still good sellers, by the way). In short, it's a great program—one everybody is going to want. In fact, I think it's going to sell its share of IBM PCs, and will certainly sell some Color/Graphics Adapters.

The price? I'd thought you'd never ask. Incredibly, unbelievably, it costs $50.

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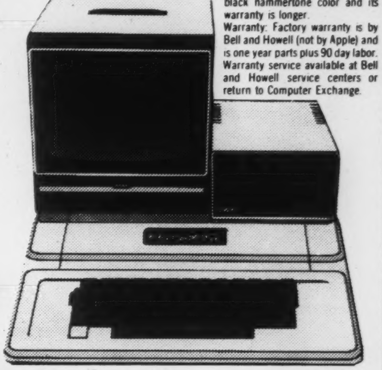

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for Apple II/II+

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on disk for Apple II/II+

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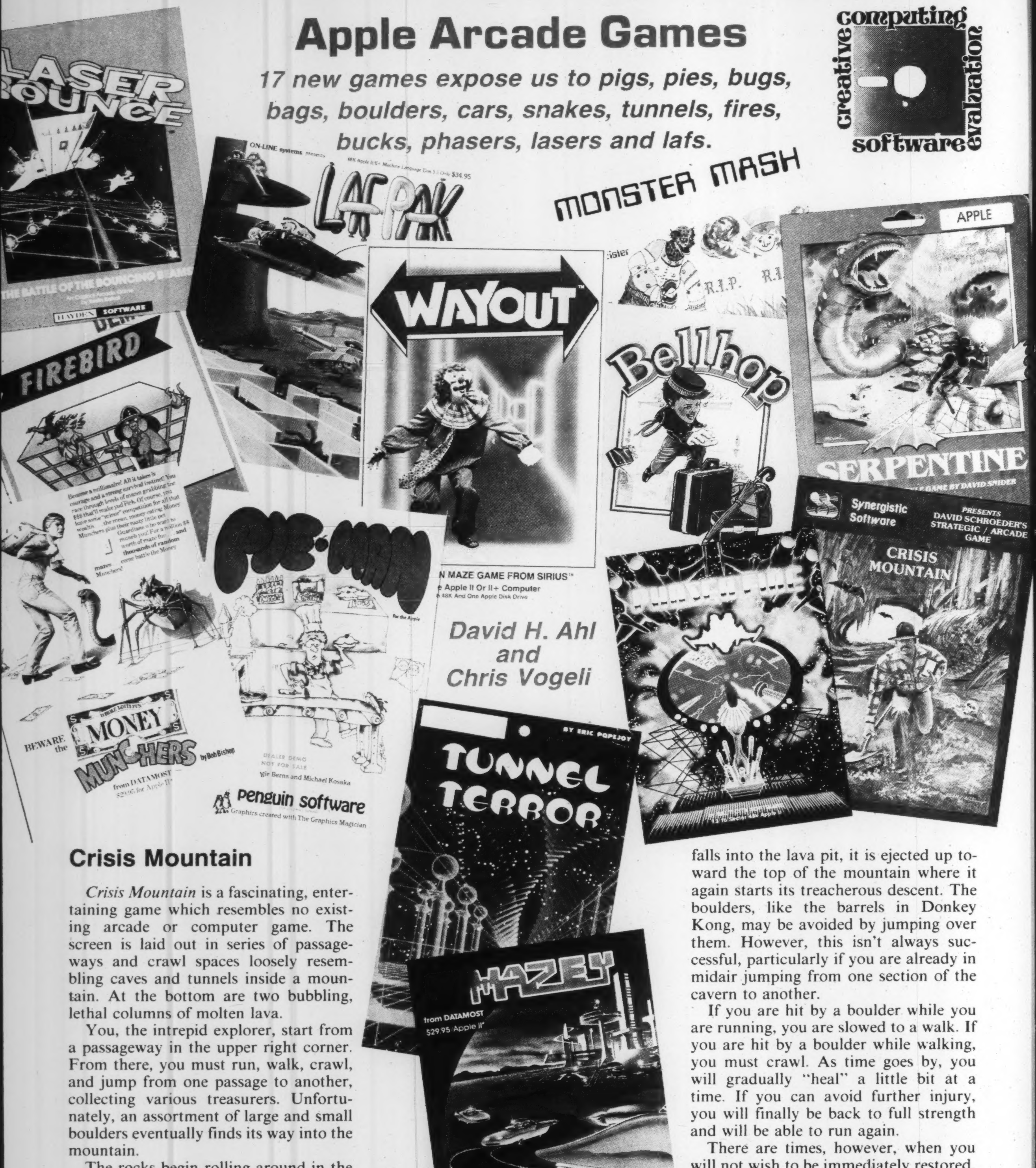
CIRCLE 140 ON READER SERVICE CARD

Apple Arcade Games

17 new games expose us to pigs, pies, bugs, bags, boulders, cars, snakes, tunnels, fires, bucks, phasers, lasers and lafs.

creative computing software evaluation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David H. Ahl and Chris Vogeli

Crisis Mountain

Crisis Mountain is a fascinating, entertaining game which resembles no existing arcade or computer game. The screen is laid out in series of passageways and crawl spaces loosely resembling caves and tunnels inside a mountain. At the bottom are two bubbling, lethal columns of molten lava.

You, the intrepid explorer, start from a passageway in the upper right corner. From there, you must run, walk, crawl, and jump from one passage to another, collecting various treasurers. Unfortunately, an assortment of large and small boulders eventually finds its way into the mountain.

The rocks begin rolling around in the caverns and on the slopes. These boulders are quite indestructible; when one falls into the lava pit, it is ejected up toward the top of the mountain where it again starts its treacherous descent. The boulders, like the barrels in Donkey Kong, may be avoided by jumping over them. However, this isn't always successful, particularly if you are already in midair jumping from one section of the cavern to another.

If you are hit by a boulder while you are running, you are slowed to a walk. If you are hit by a boulder while walking, you must crawl. As time goes by, you will gradually "heal" a little bit at a time. If you can avoid further injury, you will finally be back to full strength and will be able to run again.

There are times, however, when you will not wish to be immediately restored. This is because certain of the lower passages can be traversed only by crawling.

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CIRCLE 256 ON READER SERVICE CARD

On the other hand, you cannot leap across the mouth of the lava pit without a running start. When you are at full strength, you can change your position (upright, crawl) by using the spacebar.

Your eventual goal is to dig up and defuse the timers on two boxes of TNT located within the mountain. If you have recovered the shovel, you can dig up each bomb four times faster than digging by hand. When you finally defuse each bomb, the time remaining on the bomb clock at the moment it is defused is added to your bonus time. You then start the "bonus run" in which you are free to collect supplies and loot until the bonus time runs out, until you are hit by a boulder, until you die in the lava or are bitten by Bertrum the bat.

creative computing

SOFTWARE PROFILE

Name: Crisis Mountain

Type: Action/Strategy

Author: David Schroeder

System: 48K Apple, disk drive, paddle

Format: Disk

Summary: Action adventure inside a cave

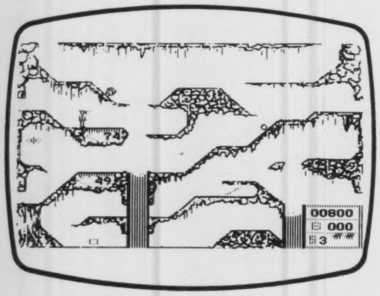
Price: $34.95

Manufacturer:

Synergistic Software
5221-120th Ave., SE
Bellevue, WA 98006

Ah yes, Bertrum. He is a crazed, radio-active bat who flies around Crisis Mountain in pursuit of human intruders. If you manage to avoid him and collect all the supplies and loot, you enter the "Nova Mode." At this point magical stars and novae appear which are worth between 400 and 3,000 points. You begin the game with three lives. Bonus lives are awarded at 10,000 30,000 and 50,000 points. If you manage to survive the first level with one or more lives remaining, two even more difficult levels await you.

Crisis Mountain can be played with either game paddles or joystick. While the instructions recommend the joystick, we found that game paddles were quite satifactory.



In summary, *Crisis Mountain* is a new and different concept that will keep you entertained and challenged for quite a long time.—*DHA*

Serpentine

Serpentine is one of the best games ever written for the Apple. In fact, when playing, you must keep reminding yourself that you aren't at your local arcade on one of the newest games. The graphics, the animation, and the strategies are as close to arcade quality as you can get.

What makes *Serpentine* so special? First, it is not like any other game (arcade or otherwise). Second, it is extremely challenging at every level. Third, it is very easy to get used to, so younger players are not frustrated by low scores when learning the game.

Far in the future, large serpents rule the globe. The serpent kingdom is divided, naturally enough, into good and evil. The good snakes are blue and the evil serpents are a sickly orange. You have managed to tame a few of the blue snakes and now, astride your reptilian mount, you set out to rid the world of evil.

The game arena is, appropriately enough, the streets of an ancient city, now reduced to a series of burnt out corridors.

creative computing

SOFTWARE PROFILE

Name: Serpentine

Type: Arcade

Author: David Snider

System: 48K Apple, joystick optional

Format: Disk

Language: Machine

Summary: One of the best

Price: $34.95

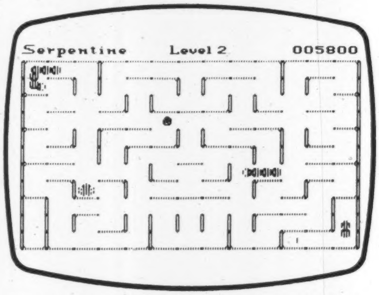
Manufacturer:

Broderbund Software Inc.
1938 Fourth St.
San Rafael, CA 94901

The screen is used to display an overview of the city. On the right, is the pen from which your snake is released, and on the left is the cage for the orange serpents. The only way to destroy an enemy snake is to eat it. You must approach the enemy from behind and nibble away at his segmented body. When you have bitten off enough to make the enemy snake shorter than your snake, he will change from orange to green indicating that he is edible. At that point you can either continue your nibbling until the enemy is eliminated, or wait until you can meet him head on.

For every snake you devour head on, your blue steed grows one segment in length. The longer your snake is, the rougher he is to defeat. Eating a snake from behind will eliminate him, but will not add another segment to your snake. You can also add a new segment by devouring one of the frogs hopping around the city.

Let's see, what else is there? Oh yes, snakes also like to lay eggs. Evil eggs are spotted; your good eggs are solid white. If you eat an evil egg, you will grow yet another segment. Likewise, if an enemy eats one of your eggs, he will grow an extra segment.

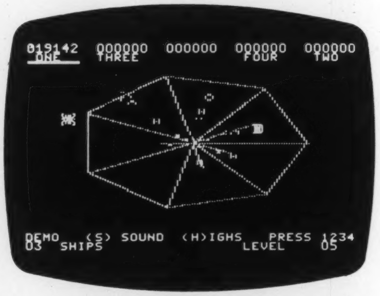


There is a great deal to think about while you are playing *Serpentine.* This is one reason that our panel preferred the joystick over the keyboard. Often, life or death depends on quick reverses or sharp turns. With a good joystick, these turns are easy. On the keyboard, they become difficult, if not impossible.

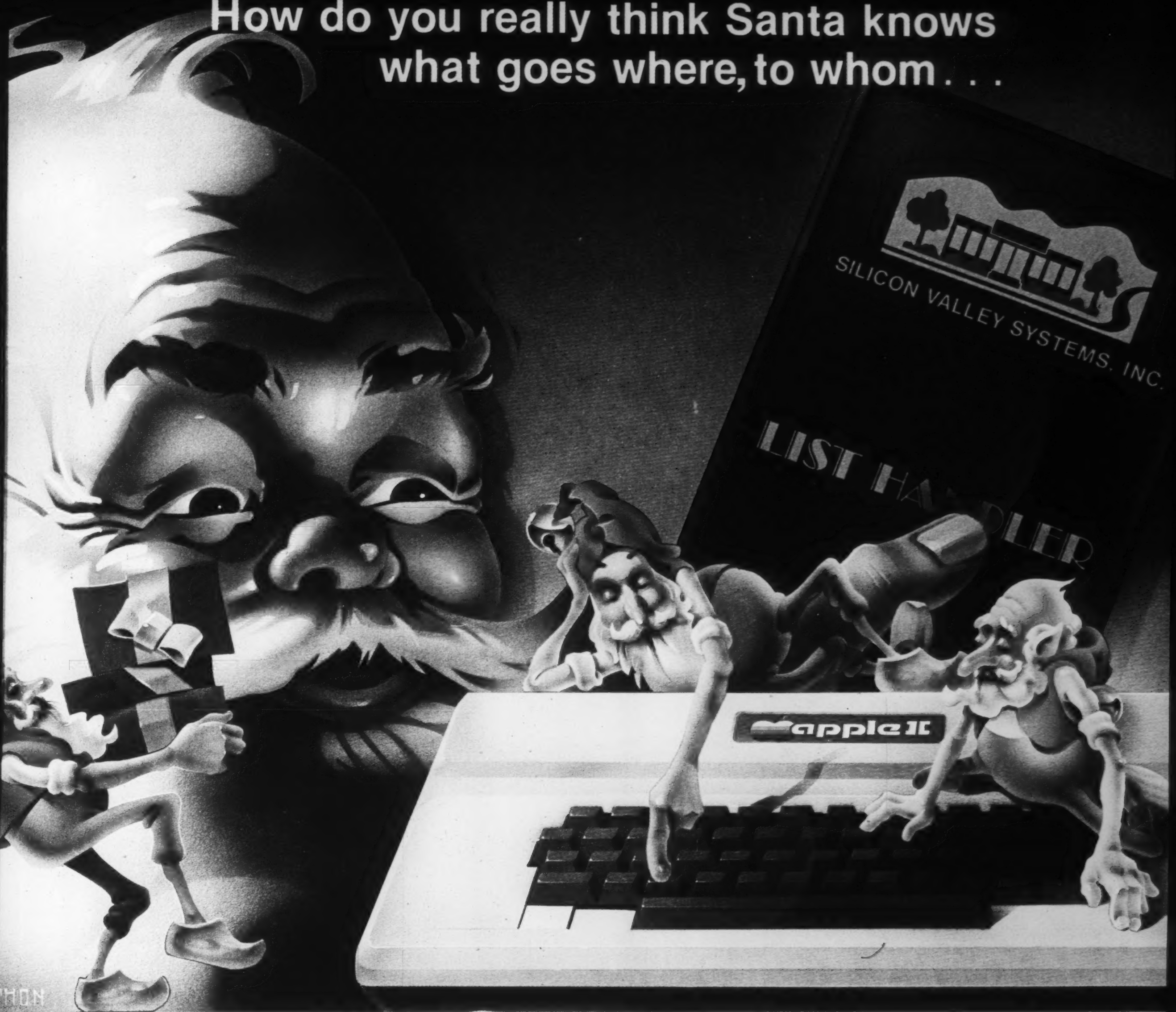
Without doubt, *Serpentine* is a game worth owning. If you are in search of fun, thrills, and excitment, *Serpentine* is to sure to delight you.—*CV*

Tunnel Terror

The packaging states, "while your ship moves around the circles on the edge of the dimensional tunnel, the enemy will move up the sides until they either reach the top or are destroyed by your ship's fission torpedoes. The enemy



How do you really think Santa knows what goes where, to whom . . .



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CIRCLE 255 ON READER SERVICE CARD

is varied as well as deadly: Walker Carriers split into two walkers upon reaching the tunnel exit and will try and destroy your ship; Crazies are unpredictable and may attack upon emerging from the tunnel or retreat back into it—if you're lucky."

Tunnel Terror is similar to the arcade game Tempest.

creative computing
SOFTWARE PROFILE

Name: Tunnel Terror
Type: Space arcade
System: 48K Apple, paddle recommended
Format: Disk
Language: Machine
Summary: Lightning fast action with superior graphics and sound
Price: $29.95
Manufacturer:
Adventure International
P.O. Box 3435
Longwood, FL 32750

Tunnel Terror can be played with either the keyboard or a game paddle. Each mode of play is responsive and accurate. In paddle mode, a small arrow apears on the screen when the paddle comes to the end of its sweep. This is an especially nice feature and easily prevents paddles from being broken by "overtwisting."

Tunnel Terror is yet another winner from AI. It combines fast animation with the superb graphics that we have come to expect from all of Scott Adams's games. With 61 different skill levels, it's hard to imagine anyone becoming bored with *Tunnel Terror.—CV*

Wayout

Sirius terms *Wayout* "a 3-D action maze game," and that it is. With a compass and mapmaker as your only tools, your task is to find the shortest way out of a selected maze. While doing so, you must avoid the mischevious "Cleptangle" which will delay your search by stealing your tools.

In the game, the screen is split in two parts. Roughly the upper two thirds of the screen shows the viewable area of the maze (mouse's eye view) directly in front of you. The lower portion of the screen is where your mapmaker tool draws a map of areas of the maze you have explored. The compasses in each upper corner of the screen show your direction of travel relative to the map. An odometer at the top center shows the distance travelled (your score).

The Cleptangle is a playful creature which appears as a spinning rectangular form, white on the front and orange on the back. The closer the Cleptangle, the faster and louder the warning light and sound will fluctuate. If the Cleptangle catches you, it will steal your compass, mapmaker, or both.

If your compass is taken, a flashing question mark appears instead of the arrow on the compasses. If your mapmaker is stolen, no additions are made to your maze map, and it flickers. You can get your stolen tools back by catching up with the luminous Cleptangle and trapping it.

When you see a door which pulsates in bright colors, you will know you have found the one and only way out. If you set a new low score for any maze, you may enter your initials and they will be saved on the disk.

Wayout can be played with the keyboard, regular joystick, or a switch-type joystick, with the Sirius Joyport.

creative computing
SOFTWARE PROFILE

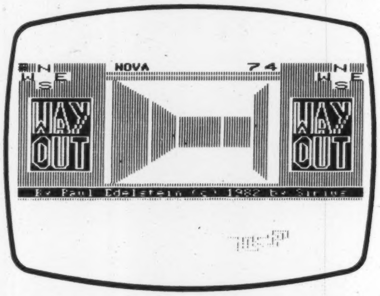
Name: Wayout
Type: Maze game
Author: Paul Edelstein
System: 48K Apple, joystick recommended
Format: Disk
Summary: Delicious frustration
Price: $39.95
Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

There are 26 mazes stored on the disk. They do not vary, so if you wish to run the same maze over and over, you can try to lower your previous score. However, after finding your way through five or six mazes, it is difficult to remember which is which, hence, the game retains a high level of challenge.

The first time through, you may be thinking the operative word is *frustration*, rather than challenge. I, for example, had an overwhelming urge to strangle the designer, having made over 3000 moves in the second maze without having found the way out. I had drawn (with my mapmaker) the entire maze, expecting the way out was somewhere on the periphery. As a result, I had failed to examine many of the U-shaped passages in the interior section of the maze. Clue: one of them is the way out.

Other mazes are similarly devious, so examine every aspect of the area of the maze you are in before going on to a new area.

There are friendly fireflys in the maze which are supposedly blown by the wind in a constant direction. We are told in the instructions that they provide a clue to the way out since the wind sometimes blows from that direction. Frankly, after many plays of the game, I have not found the fireflys to be particularly useful. Much more useful are your compass and mapmaker which, unfortunately, are subject to theft by the Cleptangle. When this happens, it is usually wise to drop what you are doing and give chase to retrieve them as quickly as possible.



Using the joystick, it is possible to navigate around the maze at considerable speed. As you enter a new area, it is frequently useful to do this so your mapmaker can draw large portions of the maze in a short amount of time. However, when you are exploring every nook and cranny looking for the way out, it is usually better to pull back on your joystick to halt your motion temporarily while you get your bearings, look around you, and adjust your direction for the next move.

Another very useful tool is the command which allows you to save up to nine locations in the maze so you can later return to the same spot instantaneously. I usually reserve location 1 for a spot near the center and 2 through 9

"Please excuse Roy, he's lost the battle of Midway 1,015 times in a row."

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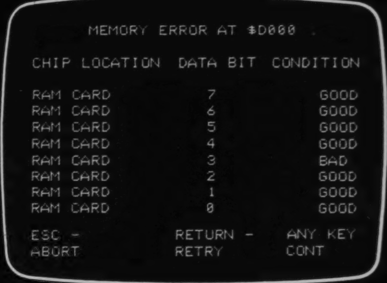

```
        MEMORY ERROR AT $D000 .

 CHIP LOCATION  DATA BIT  CONDITION

 RAM CARD          7          GOOD
 RAM CARD          6          GOOD
 RAM CARD          5          GOOD
 RAM CARD          4          GOOD
 RAM CARD          3          BAD
 RAM CARD          2          GOOD
 RAM CARD          1          GOOD
 RAM CARD          0          GOOD

 ESC -          RETURN -     ANY KEY
 ABORT          RETRY        CONT
```

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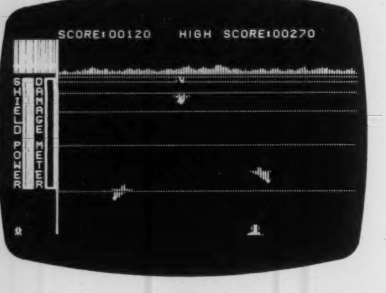
for the eight compass points near the periphery.

As you can probably tell, I have now gotten over my initial desire to strangle Paul Edelstein, and now would like to thank him publicly for creating a deliciously addictive game.—*DHA*

Phaser Fire

The instructions state, "your assignment is to use the base phaser to guard the Star Portal from attacking aliens. The Star Portal provides the passage from your world to other galaxies. The alien attackers must be prevented from entering the Star Portal at all costs since the aliens intend to use this portal to further their plans to conquer other galaxies."



creative computing
SOFTWARE PROFILE
Name: Phaser Fire
Type: Arcade
System: 48K Apple, joystick optional
Format: Disk
Language: Machine
Summary: Blast the aliens
Price: $29.95
Manufacturer:
Gebelli Software
1771 Tribute Rd., Suite A
Sacramento, CA 95861

So far, *Phaser Fire* sounds like most other space battle games. In fact, *Phaser Fire* is similar to the arcade game Radar Zone. The premise is simple, blast as many aliens as you can without losing a ship. Need we say more.

Phaser Fire should be played with a joystick. The keyboard controls just can't provide the responsiveness required to navigate the waves of attacking ships.

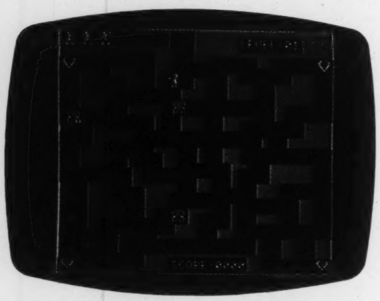
It is always hard to describe a space game in original terms. So many popular games involve some sort of laser fighting and after a time, they just become a confusing blur. As for *Phaser Fire*, it is better than most space games but it is not outstanding. Your best bet is to play this one before you pay. Who knows, *Phaser Fire* could be just what you are looking for. Certainly it will appeal to hard-core space gamers.—*CV*

Laf Pak

Laf Pak is a disk of four games: Creepy Corridors, Apple Zap, Space Race, and Mine Sweep.

creative computing
SOFTWARE PROFILE
Name: Laf Pak
Type: Four Arcade Games
Author: Charles Beuche
System: 48K Apple, joystick, paddle
Format: Disk
Summary: Four for the price of one
Price: $34.95
Manufacturer:
Sierra On-Line
36575 Mudge Ranch Rd.
Coarsegold, CA 93614

In Creepy Corridors, you must guide a small animated man around a maze of corridors, picking up four treasures located in the four corners of the maze and then exiting through a door on the right side. Hampering your progress are scores of creepy things which enter the maze from the left.



You have a gun at your disposal with which you can dispatch the creepy things to Creepy Heaven. On the other hand, this isn't always the easiest thing to do since your gun shoots only in a straight line, and few of the corridors are straight and long. Thus, good planning and quick reflexes are probably of greater value in retrieving the treasure than your weapon.

As you might expect, each level becomes progressively more difficult. How many levels are there? I don't know, but certainly enough to keep you challenged for a long time.

In Mine Sweep, the entire screen is filled with big and small bombs or mines. You have at your disposal a mine sweeper which, by using the keyboard or joystick, can be made to fire in any of four directions.

A small mine simply explodes in the square it is in, while a large mine explodes itself and the eight surrounding squares. In addition, every once in a while a mine layer zooms out and lays a new row or column of mines. Each small mine is worth one point and each large mine is worth two. If you manage to get the mine layer, you earn 100 points. Needless to say, if you are too near a large mine when it goes off, it will take you with it. You have an unlimited number of mine sweepers to use within the 2000 time units.

This is a tough little game in which you must keep moving and shooting almost constantly in order to have a prayer of clearing the board. We found that play was easiest using a switch-type joystick with a Sirius Joyport.

In Space Race, you use a paddle control to maneuver a small rocket from either the right or left side of the screen up through a portal in the top. Your challenge is to avoid giant bats which try to prevent you from reaching the escape portal. This is a game for one or two players, but be warned, you will find the computer an extremely tough opponent in the one-player game.

Apple Zap is a game played from the keyboard in which you attempt to shoot space ships and missiles coming at you from the four compass points. Essentially, it is the same game as Space Fortress on the *Escape from Arcturus* disk from Synergistic Software.

All in all, *Laf Pak* offers a lot of game playing value per dollar, and you are almost sure to find one or more of the games on this disk to your liking.—*DHA*

Firebird

In *Firebird*, you assume the role of Piggo, the fearless firefighter. You must use your ladder and firehose to quench a blaze which is destroying a hotel and wreaking havoc among the guests.

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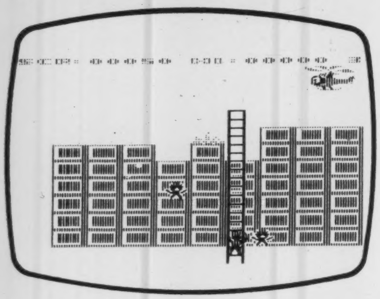


The keyboard is used to control both the movement of the ladder and the ascent and descent of Piggo. To put out a blaze in one of the rooms, Piggo must be maneuvered so that he is just to the left of the fire, and his firehose must be activated. If the fire is allowed to burn for too long, the occupant of the room will panic and jump out rather than face the flames. To catch a falling victim just move the ladder to the left of the victim and Piggo will grab him automatically.

Rather than dropping your grateful passengers off on the ground, the game requires that they be taken up to the top of the building. There, a helicopter grabs them and transports them to safety.

If the game sounds pretty straightforward so far, it is because we haven't introduced the Firebird. While you are busy saving lives and dousing fires, the Firebird, a small chicken-like creature, is starting them up again. This crazy critter runs across the top of the building leaving a trail of burning rooms behind. You can't kill the Firebird, and you can't stop him. Just try to keep up with him.

To lose the game, you must kill your three Piggos. As it turns out, this is very easy to do. If you happen to be in front of a window when a person decides to jump, you will be knocked off your ladder and fall to the ground.

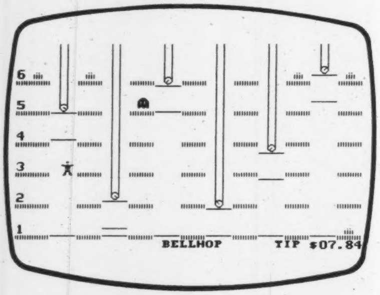
Firebird is controlled with the keyboard. In a thoughtful bit of programming, Nasir has allowed for you to custom tailor the controls. By typing CTRL-C, you can redefine all keyboard controls to suite your fancy.

creative computing
SOFTWARE PROFILE
Name: Firebird
Type: Arcade
Author: Nasir Gebelli
System: 48K Apple
Format: Disk
Language: Machine
Summary: Fire-fighting fun
Price: $29.95
Manufacturer:
Gebelli Software
1771 Tribute Rd., Suite A
Sacramento, CA 95861

All told, *Firebird* is an entertaining, fast-paced game. While it does take some time to get used to, it is incredibly addictive once you get the hang of it. If you have always wanted to be a fireman but don't like the smoke, pick up *Firebird* and live out your fantasy.—*CV*

Bellhop

A Bellhop's life is full of ups and downs. As the bellhop in a six-story hotel, your job is to deliver seven pieces of luggage to seven different suites. The suites are on the top floor, and each is served by a different elevator.

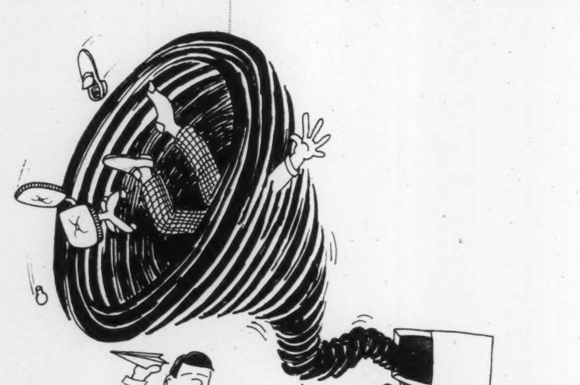


You run to the lobby at the bottom right-hand side of the screen and pick up a piece of luggage. Then you rush to the nearest elevator or call one (using the escape key) to take you to a suite that needs luggage. As you step into the elevator at the bottom of the screen, you are carried up to the sixth floor. You then step off the elevator, deposit the luggage, and jump back in for the ride down.

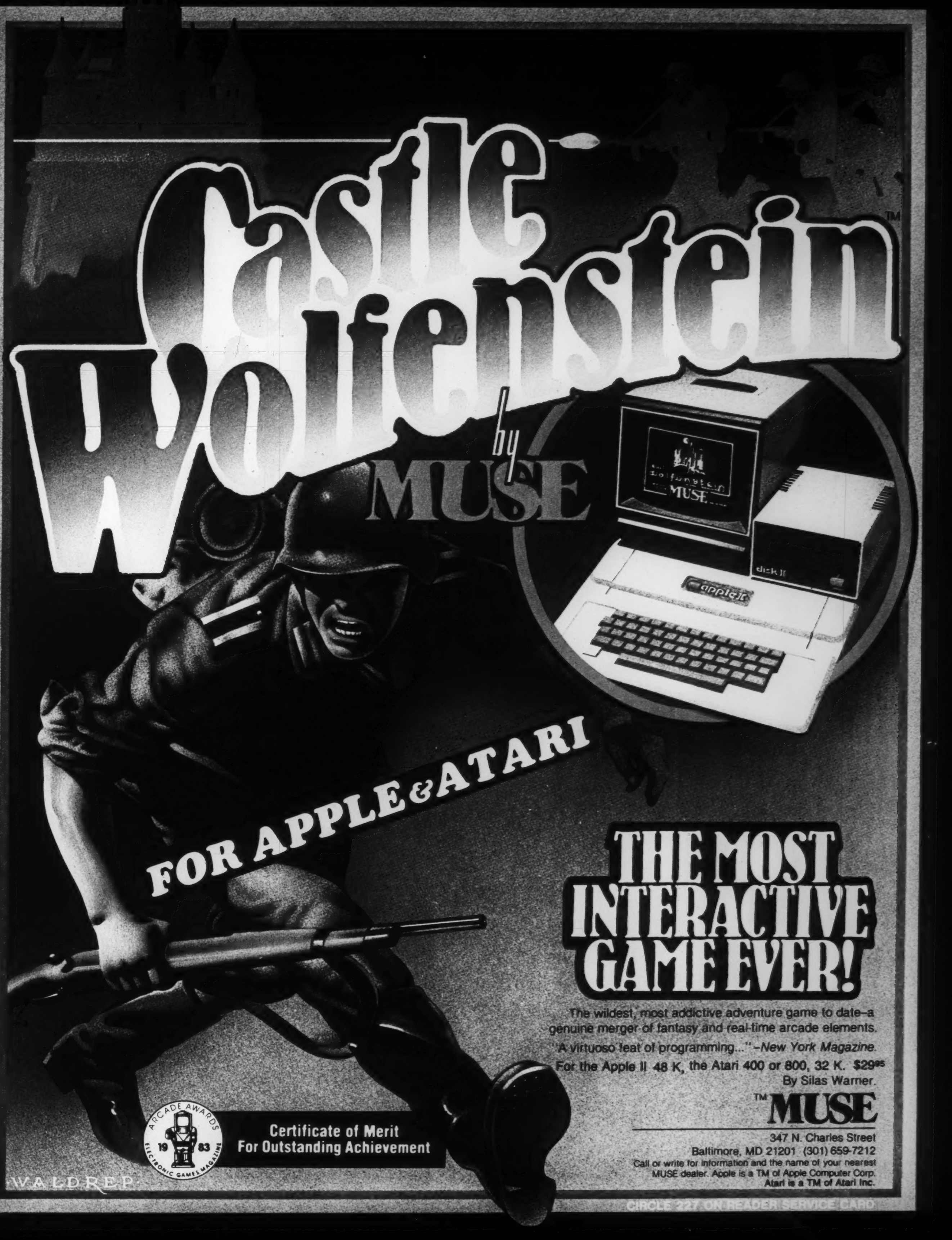
creative computing
SOFTWARE PROFILE
Name: Bellhop
Type: Arcade game
Author: John Van Ryszin
System: 48K Apple
Format: Disk
Summary: Deliver luggage and collect tips
Price: $29.95
Manufacturer:
Hayden Software
50 Essex St.
Rochelle Park, NJ 07662

Each round of the game has a starting tip value (from $30 to $60) which counts down during play. At the end of the round, when all seven pieces of luggage have been delivered, the remaining tip value is saved. When you finish all four rounds, or run out of tips completely on any one of them, the game ends and the tip values are added up and displayed so you can see how much you have earned for all your work.

After you have completed two rounds, a new hazard appears: a sneaky little hotel ghost who starts at the bottom left and works his way across the screen. Each time he moves, you lose about $2.00 in tips. When he encounters a



Say, how's that black hole simulation coming along, Chet?



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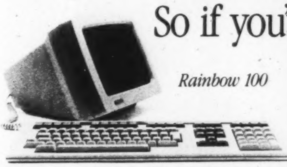

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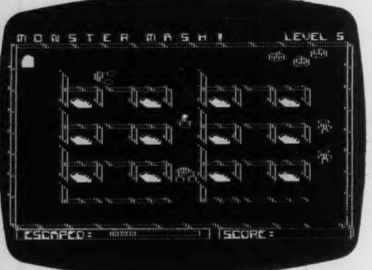
piece of luggage, he swipes it and returns it to the lobby. If you are smart, you can outwit him by choosing where you deliver the luggage.

There is another trick a clever bellhop can learn. Instead of riding the elevator all the way down, you can get off at the fifth floor and jump into an empty elevator shaft. You then descend twice as fast as the elevator could carry you and you don't get hurt either. And as the game progresses, you will need every trick in the book in order to hang on to your tips.

This is a fascinating little game, based on a novel concept. If you are dexterous enough, the fun never slows down, and neither do you! *—DHA*

Monster Mash



We are told in the promotional information about *Monster Mash* "the scene is an infrequently visited graveyard that is occupied by a rather rowdy group of monsters. It is your job to keep the monsters in the graveyard and protect the visitors using your new monster masher system."

Basically, your monster masher system consists of a series of gates (or turnstiles) that may be rotated to either a vertical or horizontal orientation. Monsters enter the screen (graveyard) at the upper left-hand corner and head toward an exit at the bottom right. By rotating the turnstiles between the rows and columns of gravestones, you are able to guide them into your clutches.

creative computing

SOFTWARE PROFILE

Name: Monster Mash
Type: Arcade game
Author: Dave Eisler
System: 48K Apple
Format: Disk
Summary: Fast fingers needed
Price: $29.95
Manufacturer:
The Software Farm
3901 South Elkhart
Aurora, CO 80014

When one of these little devils passes by one of your monster mashers (a hinged grave stone), you simply press on a key to flip the gravestone over and crush the monster.

There are four different kinds of monster: Claws (worth maximum points when nearest the entry), Smokey (worth maximum points when nearest the exit), Eggs (may be ignored with no penalty, but turn into snakes when mashed), and Snakes. Snakes are tricky and fast. They are worth three times as many points as Smokey, but also count as three monsters if allowed to escape.

Monster Mash is played only using the keyboard controls. Game variations allow it to be played with just two keys (for beginners like me) or as many as eight keys for proficient players. *Monster Mash* is a different concept from the Software Farm folks in Aurora, CO, whose farm, we hope, is free from monsters.*—DHA*

Pig Pen

The packaging has a huge picture of a warthog charging down a corridor emblazoned on the cover. In large red letters are the words, "Watch Out! The Oinks are Loose!" This is all well and good, but scary warthogs have nothing to do with the game. In reality, *Pig Pen* is yet another variation of Pac-Man.

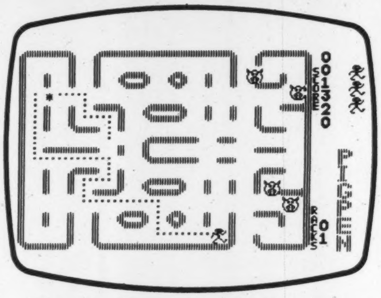
creative computing

SOFTWARE PROFILE

Name: Pig Pen
Type: Arcade
System: 48K Apple, joystick optional
Format: Disk
Language: Machine
Price: $29.95
Manufacturer:
Datamost
9748 Cozycroft Ave.
Chatsworth, CA 91311

Instead of ghosts, you are being chased by pigs, and instead of eating dots, you are scattering them in a trail behind you. Pigs are worth 200, 400, and 800 points, and can be eaten only after you have ingested one of the four pig pills located in the four corners of the maze.

In addition, an ear of corn worth 1000 points appears randomly within the maze. A joystick is a must for *Pig Pen*. The keyboard controls are difficult to master, and your scores will definitely suffer when using the keys.



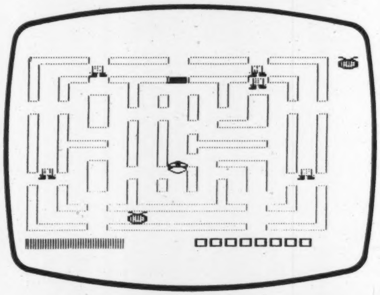
There really isn't much to say about *Pig Pen*. If you already have a Pac-Man style game, it is doubtful that you will find the variations in *Pig Pen* worth the purchase price. If however, you haven't broken down and bought a maze game yet, *Pig Pen* might be for you.*—CV*

Succession

In *Succession*, you are confronted with a Pac-Man type of maze. Your creature has an antenna on top of his head and is called the Masher. Your goal is to tag other little creatures with numbers on their bodies. You must tag them in order. At the same time you must avoid a large white creature with a big mouth who is after you (the Crasher).

There is a timer shown as a blue bar at the bottom left of the screen. You must get all the little creatures, in order, before time runs out. If you touch one of the little creatures out of order, all of them reappear even if you have gotten three or four of them in the correct order.

For clearing a level or getting all the creatures in order, you are awarded 500 points. In addition, each mark left on the timer when you clear a level is worth 100 points. If there are more than 15 marks left on the timer you get a bonus of 1000 points. Complicating the maze are doors over certain passageways which open and close randomly and, every so often, an invisible door.



If you are being hotly pursued by the Crasher or you are about to touch a creature with the wrong number, you can head out through an outside tunnel.

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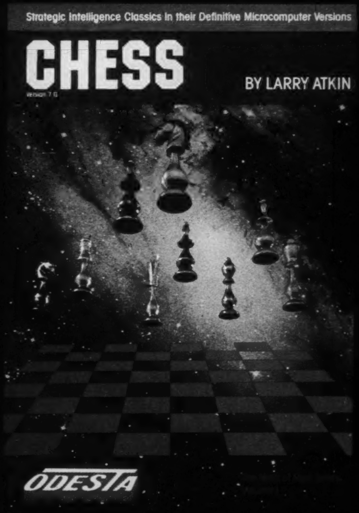
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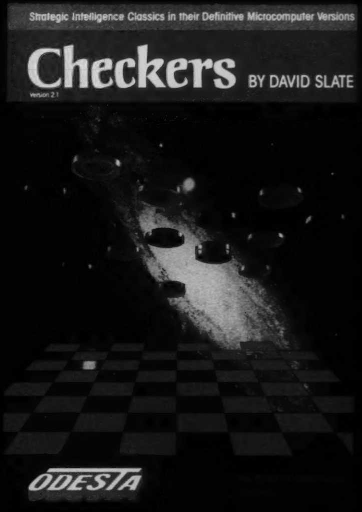
Strategic Intelligence Classics in their Definitive Microcomputer Versions
Checkers
Version 2.1
BY DAVID SLATE
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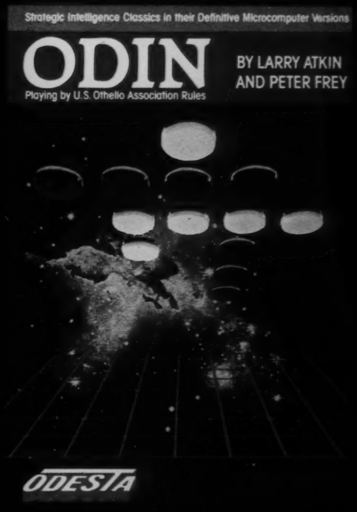
Strategic Intelligence Classics in their Definitive Microcomputer Versions
ODIN
Playing by U.S. Othello Association Rules
BY LARRY ATKIN AND PETER FREY
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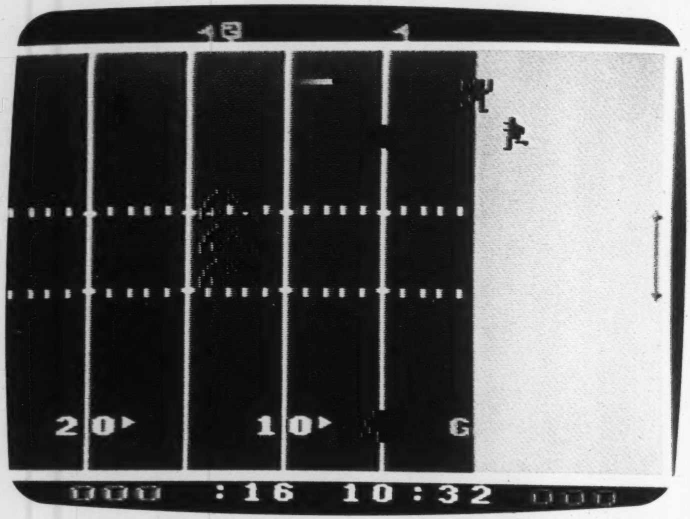

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CIRCLE 173 ON READER SERVICE CARD

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This places you at some other random spot in the maze. In general, I found this was not a good strategy since it generally took a moment or two to determine where I reappeared and, by the time I did, I was frequently in more trouble than when I started.

creative computing

SOFTWARE PROFILE

Name: Succession
Type: Pac-Man derivative
Author: Chris Eisnaugle
System: 48K Apple,
Format: Disk
Summary: To catch the creatures in order
Price: $29.95
Manufacturer:
Piccadilly Software Inc.
89 Summit Ave.
Summit, New Jersey 07901

The game may only be played from the keyboard—a slight disadvantage if you are used to a joystick for games of this type.

Succession is not an easy game. Indeed, some people will find it a mite frustrating as I did at first. However, if you get the hang of it and clear the first level, there are three increasingly difficult levels awaiting you. Each succeeding level has one more little creature to be tracked down, and each is a bit faster than the preceding one.

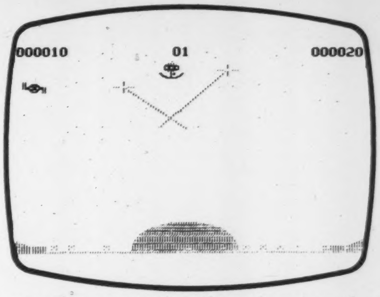
In summary, if you are tired of Pac-Man and are looking for an interesting variation on the theme, *Succession* might just fill the bill.—*DHA*

Laser Bounce

"Your City and Their City have been at war as long as anyone can remember. A defense wall exists between the cities—so high that the only way to attack is to bounce laser beams off satellites!

"The object of the games is to destroy the energy modules of the enemy while protecting your own.

"To attack, you fire a laser beam so that it is deflected by a passing satellite onto an enemy energy module."



To aim your beam, you simply move the crosshairs of your site back and forth with a paddle controller. As a satellite approaches your crosshairs, you press the fire button and a laser is fired from your base at the bottom left corner of the screen toward the satellite at the upper right from which it is deflected down toward targets in Their City on the left bottom part of the screen. Needless to say, the enemy (another player or the computer) is following the same procedure against your targets in the right-hand portion of the screen.

Played against another human, *Laser Bounce* is interesting and challenging. Played against the computer, it is quite impossible.

There are two kinds of satellites, one of which deflects the beam straight down (perpendicular) to targets on the ground; the other bounces the beam off the satellite at the same angle at which it was aimed. The perpendicular-bounce satellite is much easier to use for aiming, however, it is not always available, so the angular-bounce satellite must be used to achieve top scores. There are three levels of difficulty; however, we cannot imagine a game above the lowest level, but it may be that my age is beginning to show.—*DHA*

creative computing

SOFTWARE PROFILE

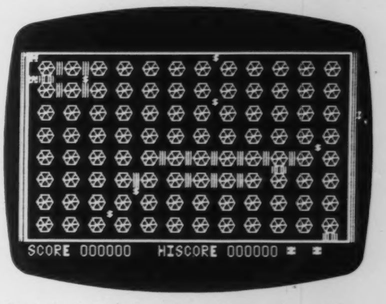
Name: Laser Bounce
Type: Arcade Game
Author: Kevin Kalkut
System: 48K Apple, paddle
Format: Disk
Summary: Nearly impossible
Price: $29.95
Manufacturer:
Hayden Software
50 Essex St.
Rochelle Park, NJ 07662

Crazy Mazey

Crazy Mazey is a hunt and chase game in which you hunt treasures in your speedy little car while vicious killer cars chase you. Your only defenses against these nasty attackers are quick reflexes and careful planning.

Each of the 19 levels is laid out in checkerboard fashion with you and the killer cars able to travel along the grid lines. There are barriers at different points, always the same on each level, that impede both your progress and the progress of your pursuers. You always start off in the upper left corner and must make your way around the board picking up treasures (designated by a dollar sign), and make your way back to the upper left-hand corner which then becomes a passage to the next level. Meanwhile, killer cars are pursuing you, one on the first level, two on the second level, three on the third and so on.

On the lower levels, the cars are relatively easy to outwit, however, on the upper levels, they become more intelligent and the barriers, more numerous. I found the even numbered levels somewhat easier because I could frequently lure cars into collision with each other, eliminate all cars, and then leisurely collect the treasures. On odd numbered levels this is impossible, of course, because there will always be at least one car left to pursue you.



The game may be played at any of seven speeds. When I first got the game, I pressed speed 1, thinking it was the slowest. It is not; speed 7 is the slowest and speed 1 is the fastest. After getting used to the game and working out some strategies at the slower speeds, I found it was most fun playing the game at speed 3, 4, or 5, depending upon the lateness of the hour.

Crazy Mazey can be played only from the keyboard, not a major problem since there are only four directional keys used in the game.

creative computing

SOFTWARE PROFILE

Name: Crazy Mazey
Type: Arcade Game
Author: Ronald Meadows
System: 48K Apple
Format: Disk
Summary: Fast-paced chase through a maze
Price: $29.95
Manufacturer:
Datamost, Inc.
9748 Cozycroft Ave.
Chatsworth, CA 91311

You start with three cars and get a fourth when you get 10,000 points. You receive 100 points for each of the six bundles of cash, and 100 points each time you cause two enemy cars to collide. I found *Crazy Mazey* a fast paced, addictive, and challenging game best played when I was alert and could outdrive and outthink the killer cars. *—DHA*

Money Munchers

When we first got *Money Munchers,* some of us were heard to mutter, "Not another maze game." When the mutterers went away, our play-testing panel was left with the game. Soon after, they were heard to say, "No, it is not just another maze game."

At the start of each game, a maze is randomly generated. The pathways are filled with dollar signs, each one worth one dollar. Your task is to guide an animated man around the maze picking up all this free money. But you are not alone in the maze.

creative computing

SOFTWARE PROFILE

Name: Money Munchers

Type: Maze arcade game

Author: Bob Bishop

System: 48K Apple, joystick recommended

Format: Disk

Summary: Munchin' money

Price: $29.95

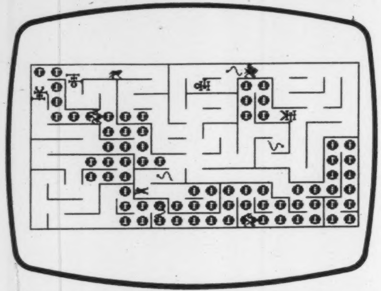
Manufacturer:

Datamost, Inc.
9748 Cozycroft Ave.
Chatsworth, CA 91311

Each maze has four Money Munchers which look something like hand lawn mowers that also gobble up money when they come upon it. Not only that, they also hate the idea of anyone else trying to snatch a dollar, so if they catch you . . . poof! . . . you are eliminated.

Once the first maze is cleared of dollar signs, you move on to the next level and an opportunity to score even bigger in the money department. However, at Level II, the Money Munchers get annoyed and call in nasty little spider guardians to help them out. These spiders hover around the uncollected money and go after you when you try to collect it.

On the third and higher levels, snakes join the fray. They ignore the money, but track you relentlessly, looking for a bite to eat.



Money Munchers can be played with either the keyboard or a joystick. We found a switch-type joystick the best control for achieving high scores.

The game is quite insulting if you don't get more than $50 or $60 on the first board. However, once you accumulate $400, you get encouraging messages between boards or upon elimination of your player. You are also rewarded with a delightful graphic between screens, but don't let it lure you into a sense of complacency because the next screen will be faster and more challenging. Beware the Money Munchers! *—DHA*

Bug Battle

So you've got an Apple and you've been reading the reviews of *Centipede* for the Atari computer and 5200 System with envy. Not that Apple owners didn't have a Centipede-type game available; they did. *Nightmare Gallery* from Synergistic and *Photar* from Softape are both loosely based on Centipede. Now, United Software of America brings us another game in this genre, *Bug Battle.*

creative computing

SOFTWARE PROFILE

Name: Bug Battle

Type: Arcade Game

Author: Mike Riedel

System: 48K Apple, joystick recommended

Format: Disk

Summary: Centipede revisited

Price: $22.50

Manufacturer:

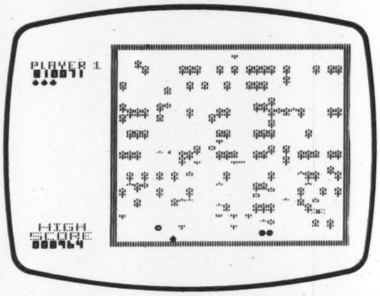
United Software of America
750 3rd Avenue
New York, NY 10017

The theme is cute. We read in the instructions that "tiny crawling pests have infested your prize winning garden. They have already devoured the tomatoes and are now heading for the main course, your carrots, peppers and lettuce.

"To insure the complete destruction of you and your garden, your jealous neighbor next door is seeding your garden with deadly Amazon Skran Weed to camouflage the release of lethal Blue Widow spiders and giant flesh-eating caterpillars.

"Your quick aim of a high-energy pest killing laser is all that stands between the survival of you and your garden and being engulfed by deadly, ever-advancing bugs."

Your laser weapon can destroy weeds (not very many points, but lots of them), the spider (bouncy and fast), the ever advancing caterpillars (which enter the screen from the top and weave back and forth) and your weed-planting neighbor. Actually, he must have hired a platoon of robots to plant the weeds because the minute you eliminate one, another appears to take his place.



In contrast to the Centipede game, the weed-planting robots run across the screen horizontally instead of dropping from the top down upon you. Also, they are far more efficient than the mushroom-dropping fleas in Centipede. It doesn't take long for the garden in *Bug Battle* to become full of weeds. Thus, it is virtually mandatory for you to hold the firing button down as you sweep back and forth across the bottom quarter of the screen (garden).

While the instructions claim that the game can be played from the keyboard, we found this mode of play next to impossible. A joystick is a far more suitable control device for your laser.

The weed-planting robots are worth 500 points each; the caterpillar, 100 points; the spider, 50-100 points (depending on how close it is to you when shot); and weeds, 5 points each. Each shot costs you 1 point.

An additional pest-killing laser is awarded at each 10,000-point increment.

We found the best strategy was similar to that recommended for the Centipede arcade game. Namely, blast two columns up each side and keep them as clear as possible. When the caterpillar enters one of these columns and starts its downward descent, get under it and blast away. Stay at the bottom through most of the game unless caterpillar segments are on the lowest level. In this

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CIRCLE 221 ON READER SERVICE CARD

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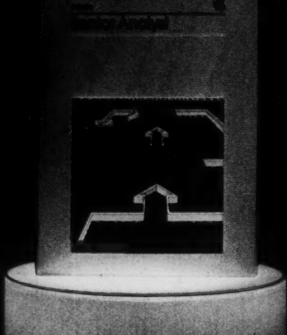

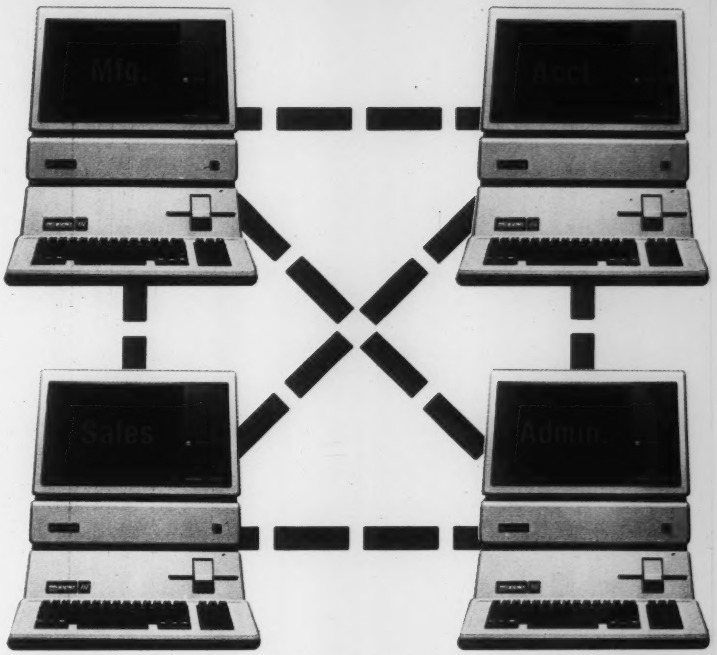

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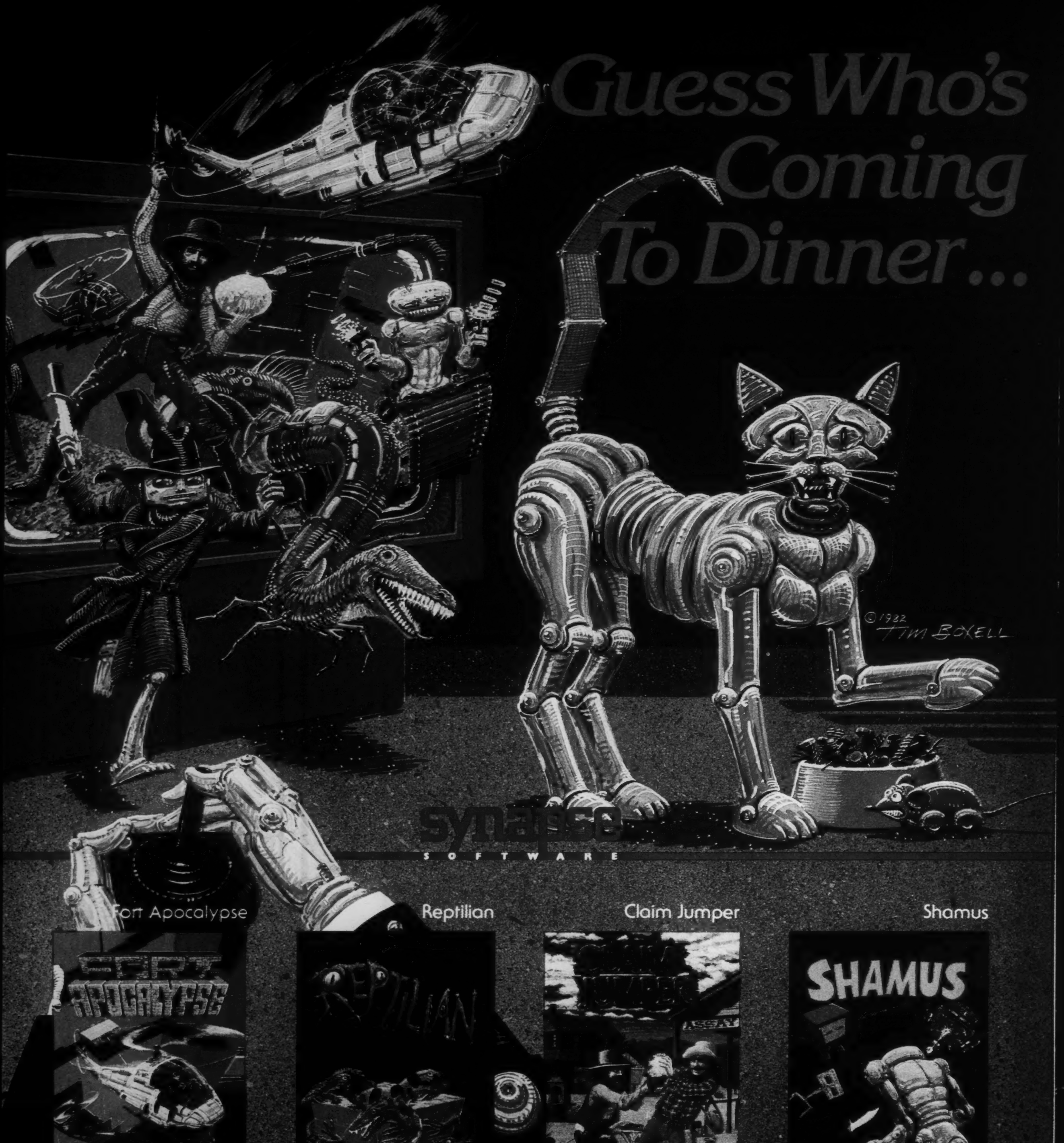
CIRCLE 108 ON READER SERVICE CARD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CIRCLE 293 ON READER SERVICE CARD

For the Atari Home Computer

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case move your laser base up and wait until the segments bounce off bottom sections of the maze or weeds and start to migrate upward. Never stay in one spot for too long or the spider is sure to get you.

We found a bug in the program which occasionally causes it to hang-up at scores of 10,068 and 10,070. Hopefully, this bug was only in the pre-release versions of the software.

As in Centipede, the play value of *Bug Battle* is very high. It is extremely addictive and was enjoyed by all members of our playing panel. Try it and good zapping! *—DHA*

The Snapper

In *The Snapper,* you are presented with a rather unusual gridwork of lines with scoring and status information above it. You control a little creature, the Snapper, directing it about the grid. The Snapper starts in the center. Toward each of the four corners are four bases. In addition, there are "blots" located randomly throughout the maze.

Your object is to eat as many of these blots as possible before time runs out. You hear a warning signal when there are 10 seconds left in the round and an even more urgent warning when 5 seconds remain. When you hear the warning, you must head for one of the bases. When you get there, the score of your blots is tallied. If you do not make it to a base in time, you start again with another Snapper, assuming you have not used them all.

Impeding your progress are "whirlers" which move around the maze on the same gridlines that the Snapper does. There is also a Gamma Field composed of undulating lines which moves at random over the entire display, similar to the Qix in the arcade game.

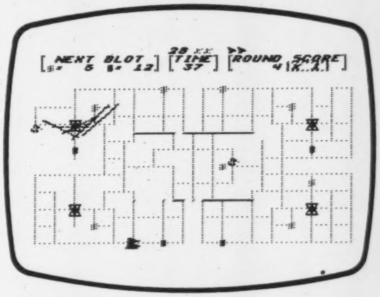
Not only must the whirlers be avoided, but they hamper your progress by occasionally erasing some of the grid lines. Indeed, as the game progresses, you will find they have erased so many lines that you can't even get to certain areas of the maze. However, after you have collected 10 blots, a magic ring appears in the center. By going over this ring, you restore the maze to its original pristine condition.

creative computing
SOFTWARE PROFILE

Name: The Snapper
Type: Maze Game
Author: Dave Sanders
System: 48K Apple, joystick recommended, 40K Atari 800
Format: Disk
Summary: Intriguing new concept
Price: $32.95
Manufacturer:
Silicon Valley Systems
1625 El Camino Real, #4
Belmont, CA 94002

As you progress to higher rounds of the game, some of the maze lines turn bluish green in color and become "slick." When you enter one of these lines, you travel all the way to the other end of it without being able to get off at any of the intermediate junctures. Thus, as the game progresses, more and more planning is necessary to survive and achieve a high score.

The scoring is rather complicated. In essence, it provides a tradeoff between survival and high scores. If you eat only a few blots before touching a base, you will live a long time, but you will not get many points. There are ways of earning an extra life, multiplying your score, and so on. As you get the hang of the game, you'll find your score rising dramatically.



In summary, *The Snapper* is an intriguing, challenging game which should hold your interest for a long time.*—DHA*

Pie-Man

In *Pie-Man,* you are a baker's apprentice in an automated bakery. Since the pies are made by machine, all you have to do is add topping (whipped cream and cherries) as the pies come out on a conveyor belt and put them away when they are decorated. Sounds simple enough, eh?

The graphics on this game are superb. When a pie comes out of the baking machine, a whistle lets out a toot, and the pie travels along a conveyor belt running from left to right.

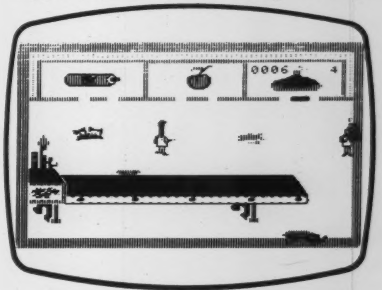
You guide a little pie man who must rush up to the bin at the top left of the screen and pick up a tube of whipped cream, then dash down to the conveyor belt and dab or squirt the whipped cream on the pie.

You then go to the cherry bin in the top center of the screen, grab a cherry, and put it on the pie. You then take the finished pie and put it in the pie bin at the top right of the screen. By this time, another pie is coming out of the machine, and you start again.

creative computing
SOFTWARE PROFILE

Name: Pie-Man
Type: Arcade game
Authors: Eagle Berns and Michael Kosaka
System: 48K Apple, joystick recommended
Format: Disk
Summary: It's a tough life in the bakery
Price: $29.95
Manufacturer:
Penguin Software
830 4th Ave.
Geneva, IL 60134

As you proceed, flour sacks get stacked on the floor in your way and grease spots magically appear, ready to trip you up. As if this weren't enough, every so often the slightly tipsy wedding cake baker dances around with his creations and steals your pies if you get in his way. Oh, yes . . .if you let seven pies fall to the floor at the end of the conveyor, you will be fired and the game ends.



We found it easiest to play *Pie-Man* with a switch-type joystick through the Sirius Joyport or with the Astar Interface. Those with coordinated fingers can play *Pie-Man* with the keyboard. However, eight directional keys must be controlled with the right hand while three action keys are controlled with the left.

Pie-Man is non-violent and funny, thus it is quite suitable for young children. The concept seems silly and simple. That may be, but it is also extremely addictive. Every time we said, "This is the last game," we decided to try it "just once more." We are sure you will, too. *—DHA* □

Games For The Vic-20

David Busch

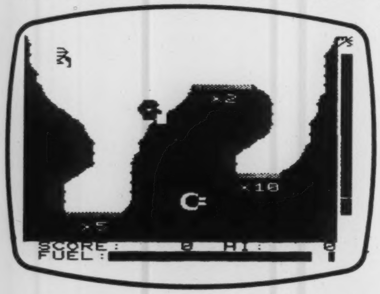
Cartridge games like these four for the Vic-20 from Commodore show why "low-end" $300 computers can compete successfully against games-only units like Mattel's Intellivision in the same price range.

These $29.95 ROM packs cost about the same as their video game counterparts, are not much more difficult to plug into the back of the machine, and offer resolution and action that is, for the most part, equal.

The ROM games make a lot of sense for both the manufacturer and the buyer. They load instantly when the computer is turned on, and are much less perishable than fragile tape, so the buyer does not need to make backups, and the manufacturer does not worry that these backups will appear in pirated versions all over the United States two weeks after the game hits the stands.

Jupiter Lander

The object of *Jupiter Lander* is—surprise!—to land a spaceship on the surface of a planet without crashing ignominiously into the craggy surface thereof. To add an element of originality, Commodore has chosen to portray the target planet as Jupiter, rather than the more traditional lunar surface.



The keyboard, rather than the joystick is used to control the lander. This was a wise choice, as three special function keys on the Vic are used to provide varying amounts of thrust. A feather-light touch is possible, and, given the requirements of the game, mandatory. Side thrusters to provide lateral movement are activated by pressing the A and D keys. The controls are simple to learn, and soon become automatic.

What makes the *Jupiter Lander* game challenging is the speed readout at the side of the screen, showing speed in meters per second. The "needle" indicator must be within a certain very narrow area, outlined in yellow, at the moment of landing for bonus points to be scored.

creative computing
SOFTWARE PROFILE

Name: Jupiter Lander
Type: Game
System: 5K Vic-20
Format: ROM cartridge
Language: Machine language
Summary: Lunar-lander type game
Price: $29.95
Manufacturer:
Commodore Business
Machines, Inc.
487 Devon Park Rd.
Wayne, PA 19087

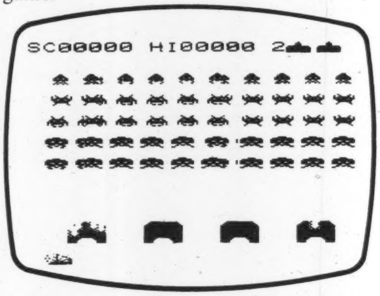
The player can swoop in for a pinpoint landing, only to lose a scoring opportunity with a heavy hand during the last microsecond.

The Jovian surface is shown in two views, a long shot, and a closeup which is displayed as the ship nears the landing site. Three landing sites are provided. An easy plateau surface may be used for practice, although the new player will require several tries before he achieves his first successful landing. Each touchdown at the appropriate speed results in additional fuel and points being awarded.

The more difficult landing surfaces provide higher bonuses. The game keeps track of high scores, which are lost once the computer is turned off.

Vic Avenger

Vic Avenger is Commodore's version of the popular Space Invaders game. It is very much like any of the dozens of other knock-offs of this arcade classic. It does make good use of the Vic-20 multicolor graphics to present a fast-moving game.



Control of the player's missile-firing base is through a standard Atari joystick, which may be plugged into a port built into the right side of the computer. Because there is only one port available for these controllers, Vic games are limited to single-player action at this time.

The player is given three bases to start

creative computing
SOFTWARE PROFILE

Name: Avenger
Type: Game
System: 5K Vic-20
Format: ROM cartridge
Language: Machine language
Summary: Space Invaders-style game
Price: $29.95
Manufacturer:
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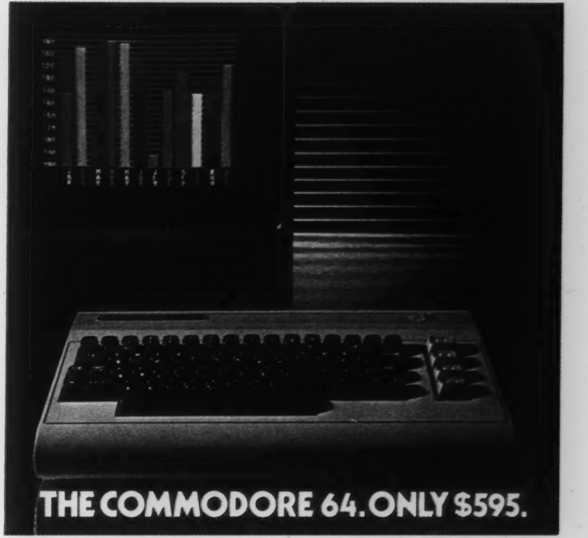

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Vic Games, continued...

and is awarded an extra base at 1500 points. The movement of the invaders is mercifully slow at the beginning, so that even a novice should have no trouble eliminating the first wave. As the speed increases, the game becomes more challenging. Those who have played hundreds of games of Space Invaders on many different computer systems will probably tire of this rather quickly. Diehards will happily test their skills on yet another version.

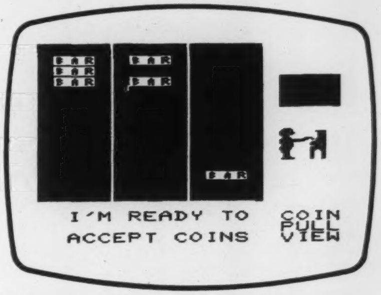
Superslot

I rated *Superslot* as the least interesting of the three arcade games, mostly because slot machine games traditionally require no skill or strategy—just a player willing to drop in coins and pull on the arm of the machine. In fact, I rewrote the last slots game I came across to perform these tasks automatically, and let the game play itself. I came back in a few hours to see how long it had taken to consume all the money allotted at the beginning of the session.

Superslot seems to amuse younger children quite well. The spinning reels are realistic, have finely detailed cherries, apples, and other fruit, and make a joyful sound as they grind to a halt.

The player begins with 80 coins. Joystick control makes this a painless game to play. The fire button is pressed to insert from one to five coins. Each additional coin dropped increases the number of winning combinations, although this makes no difference at all in improving the odds over the long run. Pulling down on the joystick activates the slot machine. Pushing up switches the display to a chart that portrays the winning combinations available.

Every time the player wins, his stake is increased noisily, one coin at a time. If one of the higher pots—300 or 400 coins—is won, this process can take several seconds. I have yet to win the big 3000-point jackpot, but would guess that a lunch break could probably be taken while that bonus accumulates.



I'M READY TO
ACCEPT COINS

Because no skill whatsoever is involved, this game will quickly bore the non-Vegas-frequenting older child or adult. Unless one manages to win one of the larger prizes, *Superslot* invariably becomes a contest to see if the player can keep pulling the lever until all the coins are lost. Frequent small wins can drag this process out to more than an hour. The larger pots are infrequent enough that one is tempted to quit while ahead, rather than spend the time needed to squander two or three hundred coins.

creative computing
SOFTWARE PROFILE

Name: Superslot
Type: Game
System: 5K Vic-20
Format: ROM cartridge
Language: Machine language
Summary: Vegas slot machine
Price: $29.95
Manufacturer:
Commodore Business Machines, Inc.
487 Devon Park Rd.
Wayne, PA 19087

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Vic Games, continued...

Sargon II

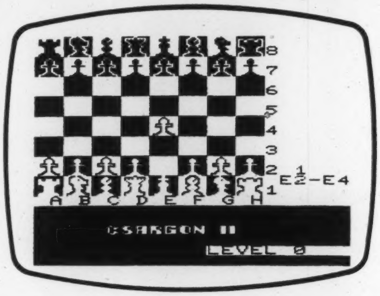
Vic-20 users will welcome this version of the redoubtable *Sargon II* chess program on ROM cartridge. All the famed Spracklen goodies—and a few new options, such as choice of screen color combination—are available.

The game comes up instantly when the power is turned on. The player is asked if he desires a game (G) or board setup (S), and is offered a level of play, from 0-6. At level 0, the computer responds immediately, and plays a good novice-level game. Average responses at higher levels run from 20 seconds (level 1) to four hours (level 6), although the documentation cautions that actual time may vary from 1/3 to three times these lengths.

The chess board is displayed in the upper left of the screen, with ranks and files noted in the border surrounding it. At the right is a listing of the last five moves. Game level and an asterisk (indicating that *Sargon* is thinking, and not locked in an endless loop) are displayed at the bottom of the screen.

Pieces may be moved by entering standard algebraic notation at the keyboard (i.e., A2-A4), or by using the joystick to "pick up" a piece and deposit it in a new location. Invalid moves are, of course, not allowed. While beginners may like the joystick movement, I recommend learning and using the rank-and-file notation to maintain compatibility with the rest of the chess-playing world.

Hitting a question mark causes *Sargon* to provide the player with hints, and works at every level but 0 once the game has progressed far enough that the computer is actually looking some plies ahead and not resorting to book moves. The game also has other features that help the beginner learn chess more quickly. For example, it is possible to take back a move, or set up the board to play from any point in a game.



1 E2-E4

©SARGON II

LEVEL 0

creative computing

SOFTWARE PROFILE

Name: Sargon II Chess
Type: Game
System: 5K Vic-20
Format: ROM cartridge
Language: Machine language
Summary: Computer chess game
Price: $39.95
Manufacturer:
Commodore Business Machines, Inc.
487 Devon Park Rd.
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For the complete novice, the instruction manual even provides a brief discussion of the rules, and charts showing how each piece moves. Only the most elementary strategies are recommended ("moving pawns and knights out first is a good opening strategy"), but enough information is given that a beginner can buy this cartridge and begin play the same day.

Given the ready availability of a flexible, challenging partner, *Sargon II* makes it easy for chess nuts to get hooked and go on to books and other aids. ☐

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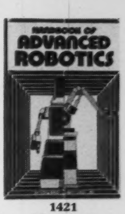
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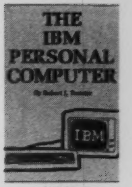
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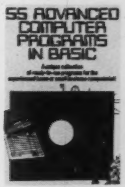
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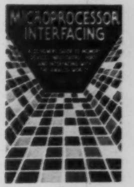
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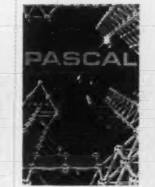

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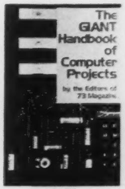
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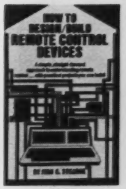
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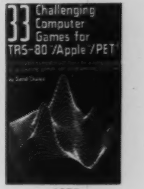
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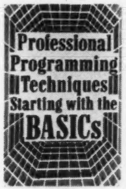
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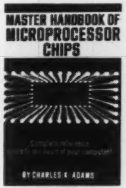
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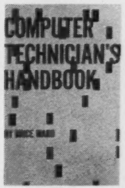
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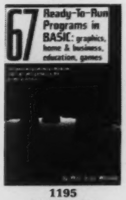
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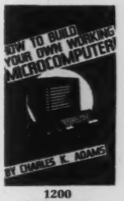
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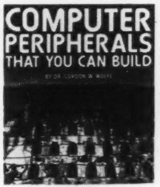
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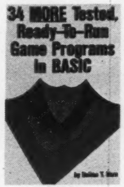
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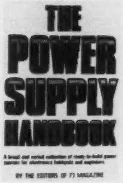
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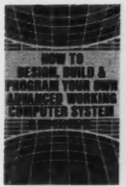
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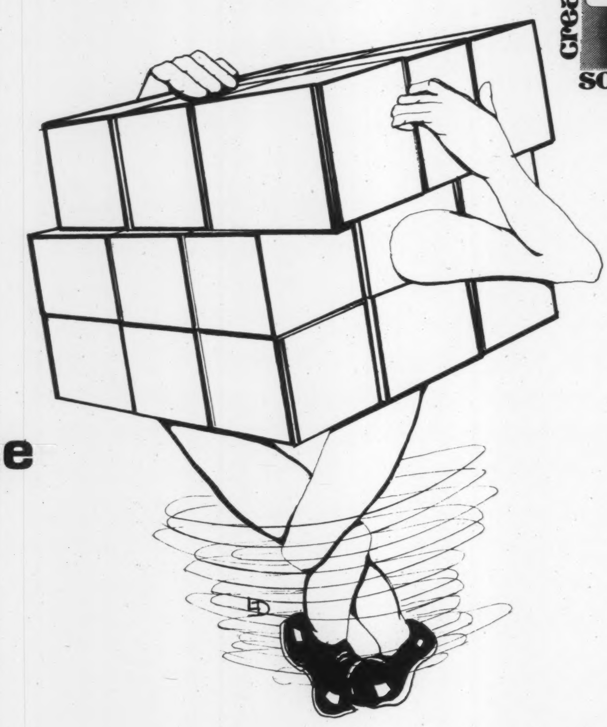


Rubik's Revenge

Brian J. Murphy

Having conquered all the known world, the irresistible wave of cube puzzles has invaded the realm of microcomputing in the form of David Barstow's *The Programmable Cube* which, like its real-life counterparts, is much more complex than it seems at first glance.

For casual cubesters and those with short interest spans, the program would appear to be a poor investment in comparison with a real cube puzzle, which costs only a few bucks. But for those who like doing mental calisthenics, who have developed cube solving theories, or who would like a beginner's level introduction to programming principles, *The Programmable Cube* offers many delights.

When you boot up the disk, you see three faces of a cube. Facing you are the red striped, green, and blue sides. Mirror images reveal the colors of the sides facing away from the viewer: gold, violet, and orange. Like the original cube, *The Programmable Cube* has nine smaller cubies per side. A system of simple commands—F moves the front side one quarter turn clockwise, U moves the upper side a quarter turn counter-clockwise—enables the user to manipulate the cube in exactly the same way as a real puzzle. In fact, using this set of 18 commands, you can scramble your cube and attempt to solve it with about the same ease as the real cube.

creative computing

SOFTWARE PROFILE

Name: The Programmable Cube
Type: Cube puzzle simulation
System: 48K or 64K Apple II with disk drive
Format: Disk
Language: Pascal
Summary: A puzzle and a learning experience.
Price: $34.95
Manufacturer:
Metacomet Software
P.O. Box 31337
Hartford, CT 06103

If you like, you can bevel the entire cube around using a set of nine rotation commands. This means that the faces the computer recognizes as the front, back, right, and left, will change, adding an extra challenge in solving. At this point you can also combine commands in a series before you press Return to execute, giving you the opportunity to relax and just watch the cube twist and spin itself.

Once you have mastered the simple moves, the program allows you to Scramble the cube to your heart's content. You specify the number of twists the cube will be given, the computer figures it out without actually showing you the moves, and the jumbled result is displayed a few seconds later on screen.

Scrambling with three or four turns might not be too big a challenge for an experienced cube solver, even given the necessity of becoming used to the simulation, but if you pick a factor of 30 or 100 turns for your Scramble you may be in trouble. There are two ways out. One is to Reset the puzzle, which simply re-

---

Brian J. Murphy, 133 Post Rd., Fairfield, CT 06430.

arranges the cubies into their original positions.

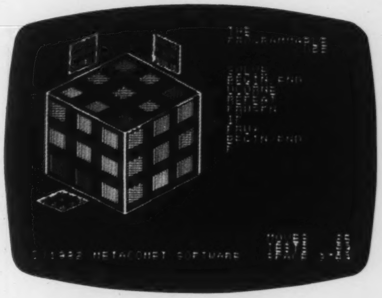
The other way is to use the Solver program, which will undertake to do the job itself. Sitting back you can enjoy the spectacle of a cube apparently struggling to solve itself. Ah, sweet revenge...

Should you still want to do the job yourself, but hate having to enter all those moves into the computer, the game comes with an easy to follow instruction booklet which leads you, step by step, though a special programming language you can use to write your own cube-solving programs.

Programming A Solution

Barstow's game allows you to take those theories of yours, those formulas, those hunches, put them in program form and turn them loose on the cube until—one hopes—a solution is derived. This simple programming system allows you to define moves individually and in series. You can write a program to recognize when all the cubies are in their proper position, and to exit once that is accomplished.

About the only real barriers to the process of learning to program with *The Programmable Cube* are getting used to the two dimensionality of the cube and learning the names of the 26 cubies, which are named not by the colors on the hi-res screen but their up, down, right, left, back, and front locations. Sometimes it is hard to remember that the violet, blue, and gold cubie that is so far away from home is really the FDL—Front, Down, Left. It helps to make a chart of which colors correspond to which directions.



The author told us that he developed the program not only because he was interested in the cube as a puzzle which could be adapted to computers, but also because it would make a useful tool with which to analyze cube algorithms and to teach elementary concepts of programming.

The Programmable Cube certainly achieves these goals, and in an amusing, entertaining way. The hi-res graphics are pleasing to the eye, although the animation is unexciting.

Commands are executed quickly, but it takes a second or two for the prompt to reappear, surprisingly slow for a program written in Pascal. By the way, don't panic: *The Programmable Cube* will load its own Pascal into your Apple without you having to buy Apple Pascal.

You may want to invest in a 16K RAM expansion board, however, because *The Programmable Cube* comes in two versions, 48K and 64K. The programs use up a lot of memory when you write your own solver, and in the 48K version you have room for just one moderately long solver program. In 64K you have enough free memory to load one long or two compact solvers.

So, if you don't have VisiCalc or a word processor but still have the itch to upgrade to 64K just for the fun of it, here is the excuse you have been waiting for. Tell your missus (or mister) that you have become a cubeaholic, and you must have a 16K expansion board to sate your ungodly appetite.

Who knows, maybe after you have fooled around with *The Programmable Cube* long enough, you'll become a cubeaholic for real. ☐

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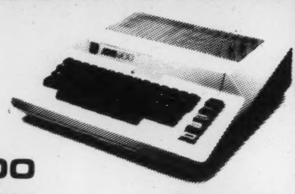

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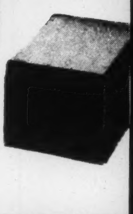

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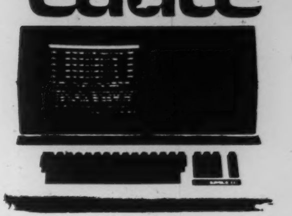

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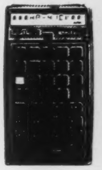

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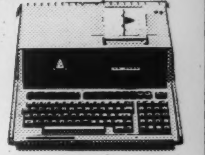

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CIRCLE 171 ON READER SERVICE CARD

Light sources can be moved right into the frame. Note the accuracy of the shading. Copyright 1982 Walt Disney Productions.

The Gift of the MAGI

John Anderson

Before the letters MAGI came to be the acronym for the Mathematical Applications Group, Incorporated, they formed the plural of the singular *magus,* which came from the Latin meaning "sorcerer." From this root came the word magic. This is entirely appropriate, as we shall see.

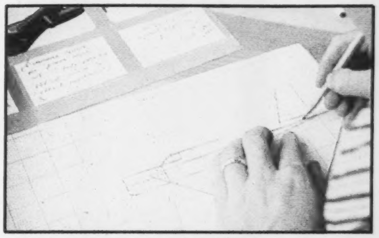
Magic is not a bad word to describe what is going on at the MAGI facilities in Elmsford, NY, and Santa Monica, CA. With the publicity that has accompanied the film *Tron,* it is unlikely that you are entirely unfamiliar with the work of MAGI. If, in addition, you have seen commercials for the arcade game Zaxxon, or the home video game *Worm War I* (which, by the way, was written by my predecessor at *Creative,* David Lubar), you have seen the work of MAGI. What you have seen is vivid, computer generated imagery, real enough to captivate.

I recently had an opportunity to visit the Elmsford labs of MAGI, and to speak with some of the people who are responsible for these remarkable effects. Crossing the Tappan Zee Bridge on a misty morning, I made the turn into Elmsford. I fought back the urge to look for the tower of the Master Control Program, and followed the directions I had with me.

The first person I spoke to when I arrived was Chris Wedge, a young artist and animator. He led me through a labyrinth of corridors. Computer animation is only a small part of what MAGI does. With over 150 employees, they also provide computerized services for the direct mail industry. They developed a business slide-making system now marketed nationally by Xerox Corporation. The company is also involved with computer aided design and manufacturing (CAD/CAM). Chris led me back to the section of the building where computer generated animation takes place.

3-D Ferrari

He had what looked to be the gutted remains of a toy car. Stripes of fine tape mapped grids across the contours of red fenders, hoods, and doors littering his desk. "I'm modeling a Ferrari," he explained. "The process of inputting its three-dimensional coordinates is somewhat tedious." He directed my attention to a Chromatics terminal nearby.



First the design must be fully delineated on paper, so the artist may input it to the computer as a series of connected shapes.

There on the screen was a rudimentary rendering of the car, as if it had been fashioned out of luminous guitar wire. With the click of a few keys, he made the image spin slowly. "This is the first step," he said, with a smile. "Once we have the shape fully defined, we can make it do anything we want it to do."

We were joined by Larry Elin, who manages the place and had been kind enough to invite me for the visit. I had recently read his piece in *Artist and Computer,* and enjoyed it. I asked him to provide a bit of background about the company.

MAGI, he said, was founded in 1965, by Dr. Phillip S. Mittelman, a nuclear physicist and noted computer scientist. He has degrees from Harvard as well as Rensselaer Polytechnic Institute.

The company at that time had absolutely no intention of becoming involved in computer graphics. They were involved, however, in three-dimensional modeling and simulation. In fact, under the direction of Dr. Mittelman, who remains president and chairman of MAGI, the company conducted shielding studies of theoretical nuclear blasts.

MAGI is no longer involved in any way with nuclear studies or in any government contract. It may seem a far cry from nuclear shielding studies to the graphics of *Tron,* but the jump was really not all that great. The tool for three-dimensional simulation had already been developed. In 1967, the first graphics using the systems were initiated, as a research and development tool. The first picture generated was of a helicopter.

A System Ahead Of Its Time

The system had, by 1972, reached the point where it was decided that a commercial animation service could be embarked upon. MAGI was then too far ahead of its time. In 1973, when Larry Elin, in his own words, "married the boss's daughter," a rethinking of the project took place. It was determined that the audience, capability, and acceptability of the system had been misjudged.

They did not give up, however; the

The codes of the entered data are displayed on a separate terminal.

The designs are compared against initial results, with a mind toward instituting improvements.

Production Manager Nancy Campi, Senior Creative Director Richard Taylor, and Animator Chris Wedge evaluate results.

project was kept alive. The software team, consisting of Dr. Mittelman and many scientists still with the company today, continued to improve the software. The idea was to wait until the time did come.

They dubbed the system SynthaVision, and waited. And their time finally came.

In 1978, competition began to appear—Robert Abel Associates, NYIT, and other groups. Computer power was getting cheaper. The creative possibilities of computers blossomed, as did interest in their potential as artistic tools. In early 1979, Disney Studios approached MAGI, expressing interest in computer animation techniques. At roughly the same time, the business slide system was improving the cash flow for research and development in computerized animation techniques.

A group of test films was created to explore the possibilities of the SynthaVision system. Steven Lisberger, the motivating force behind *Tron*, was extremely pleased with preliminary results. The impetus was there now to spur dramatic improvements in the software. Thus the process came to be one of the leading technologies in the field of computer animation.

Chris took me into the cold, humming computer room, and showed me hundreds of reels of magnetic tape. On each tape, there are five to eighteen final film frames, depending on how much data is necessary to construct a specific frame. Chris underscored the parallels between the SynthaVision process and traditional stop-motion animation, in which he was trained. However, instead of an artist doing rough drawings on paper, going from storyboards to meticulously executed cel transparencies, and then to the camera, this whole process takes place in the computer. It becomes the animator's job to define that "world," which will, as a final step, be photographed.

Defining A Camera

The objects, whether lightcycles or Ferraris, must first be defined. Once they are, they need never be redefined—they will then be generated and regenerated as three-dimensional data sets. They can be depicted from any angle and at any distance. The next task is to define a camera, explicitly setting parameters for its focal length. The animator may desire for a given shot a wide angle or a more narrowed perspective. Of course the camera position and angle must be determined. Inputting the background and defining the intensity as well as the positioning of the light source follow. The complex software takes over from there—to create entirely ficticious but utterly believable pictures.

Camera movement and object movement is defined entirely by the animator. Chris therefore feels not in the least compromised by the technology with which he works. As graphics systems become more sophisticated, offering immediate feedback to the artist, animators will not need to be on the intimate terms Chris is with details of the system. Animation can be done poorly through the MAGI system, he stresses, just as it can be done poorly using traditional methods.

The animator is still ultimately responsible for the finished product. Without him, it will be impossible for a Recognizer or a sports car to roll around a curve or tip off a precipice in an acceptably realistic or stirring manner. While animation has undeniably been transformed, creative human input remains undiminished—is, in fact, extended and enhanced.

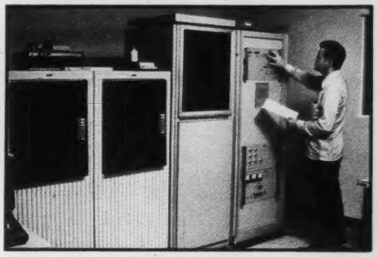
The current hardware consists of a Perkin Elmer 3240, hardly what one might call a micro, I would agree. A new computer room is now under construction; it will house an SEL computer, which is about seven times faster. This will help surmount the delayed feedback problem. A special camera is used to expose computer images on 35mm film. An image is projected on a flat screen CRT, capable of generating extremely high resolution, even though the screen is no more than six inches in diameter. In fact, there is no shutter in the camera—the film is exposed by the single scan line.

When the frame is completed, the screen goes dark, and the film is advanced another frame. Color is handled in what amounts to a Technicolor process—black and white separations are created initially. Color can then be created and manipulated in any way desired.

The SynthaVision technique is a marriage between computer and existing film technology—Wedge evoked the

Light attenuation into the distance.
Copyright 1982 Walt Disney Productions.

Systems Manager John Beach threads a reel into the computer.



John sets up the camera.

The Wunderkinder: among them, Dr. Mittelman in the foreground, Larry Elin seated to his right, Chris Wedge on the far right.

term computer-assisted animation to describe the process.

Though the *Tron* script was entirely storyboarded, it evolved as time went on, as did the capabilities of Syntha-Vision. The casting of shadows, the depiction of reflections on the surfaces of objects, and the attenuation of light—that is, the drop-off in the intensity of light with the increase of distance—were added to the system.

Artist's renderings of each shot were laid out in detail so that everyone could clearly understand what would transpire in any given scene. After a shot had been entirely specified to the computer, it was studied on color terminals, then reworked as many times as necessary to perfect the shot.

For *Tron,* a terminal was installed at Disney Studios and a modem used to send shots for analysis directly. Disney in some cases called for subtle changes—Elin states that his crew learned a great deal about the mechanics of animation from Disney experts.

The animators at MAGI are quite seasoned. But they are only half the crew. The other half is composed of the programmers, the mathematicians, the physicists—they are not concerned in any way with the projects at hand. They work only to improve the software.

Left Brain, Right Brain Gap

And so the MAGI group works in these divergent directions, while successfully bridging the supposed and celebrated "left brain, right brain" gap between scientific and artistic minds.

Larry states that the gap is not nearly as big as we tend to think it is. There is mathematics in art, and art in mathematics—the difference is more semantic than philosophical. A common vocabulary, like pictures, can bridge the gap. The MAGI artists and programmers embody this idea in their mutual respect for one another. They set an example well worth noting.

Chris Wedge said that bridging this gap might be essential to our evolution as a species. Larry stated the ideal quite succinctly, evoking the term "renaissance." He hopes that technology will foster a real renaissance for the American animation industry.

Elin asserts that the computer can provide an indispensable tool for the animator, but that we should not expect too much from it. The computer can replace the "stoop" labor in animation, but never the inspiration or the artistry. He very fervently believes that computers will never generate acceptable computer animation of characters themselves, at least not with much more quality than the stuff currently littering Saturday morning television.

Recognizers leave their shadows on surfaces far below.
Copyright 1982 Walt Disney Productions.

Elin's vision is one wherein the computer can clear the way for the artist to focus on truly caring character animation, taking account of things like expression and body language.

And what of the future? Better software and peripherals will make the process more flexible for the artist. Right now the artist works more or less blindly, waits, sees a few seconds of a result, and on that basis, modifies the effort. Efforts are underway to change this.

Christine Chang, another member of the animators staff, showed me a system now under scrutiny by Disney, wherein cels are colored using a sophisticated graphics tablet—rather than someone having to sit and color each cel meticulously by hand. This dramatically boosts productivity, and combined with other computer techniques, will contribute to the revitalization of the animation industry in this country. Certainly the only way the U.S. will ever regain preeminence over foreign concerns is to use its technology to make the process cheaper, without sacrificing quality for automation, as it has in recent decades.

As the state of the art approaches photorealism, computer assisted animation will be used more regularly in live-action films, and not just for special effects. Francis Ford Coppola has already foreseen the day when his "studios" will, in large part, reside inside a computer. If he wants, for example, a ghost town in the Old West, he will simply have one generated. The day remains in the future, but inexorably approaches.

As for the possibility of *Tron II,* Elin would not be pinned down. He says Disney continues to ask for tests. Exploration is currently in progress for a new Maurice Sendak film to be produced by Disney studios.

It remains for MAGI to show the magic of a partnership between Disney's acknowledged masters, and the new *Wunderkinder* on the block. You can bet the results will be interesting—and revolutionary. □

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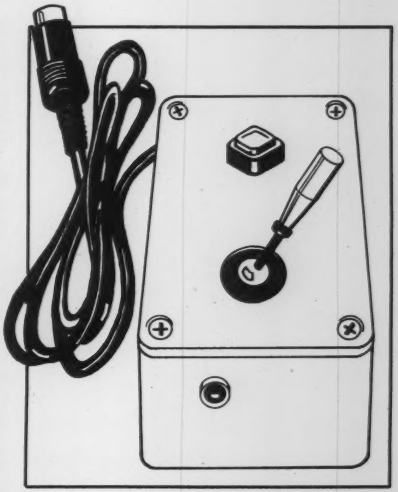
David H. Ahl



Color Computer owners, have you been looking enviously at the many high quality joysticks available for the Apple? Has the dimpled contact in your Color Computer joystick button come to the end of its short life? Do you yearn for a joystick with a precision feel?

If you can answer yes to any of these questions, you are a candidate for a replacement joystick for your Color Computer.

Unfortunately, your choice is not nearly as wide as the choice available to Apple or Atari owners. However, recently the situation has taken a turn for the better with several replacement joysticks making their way to market. One of these is Spectrum Stick. This rather massive 6″ x 3″ x 2″ unit is more than twice the size of the Radio Shack original equipment Color Computer joystick. However, the largish blue plastic case houses a joystick with real potentiometers, a heavy duty pushbutton, and an LED indicator that shows whether power is on or off to the computer.

The LED indicator may be the best thing of all. How many times have you turned off your TV first and forgotten to turn off the computer? Not that this indicator will turn it off for you, but if you get in the habit of putting the joystick down on top of the computer, the indicator is a handy reminder.

The size lends itself to both hand-held and table top use. The central placement of the firing button makes it suitable for both left-and-right handed players.

The joystick handle is about 2″ long (the same as the original equipment one), but the handle itself is $\frac{3}{8}$″ in diameter, a somewhat handier size to grasp. The joystick movement is considerably stiffer than the original, and is about the same as the stiffest of the nine Apple joysticks we tested in 1982. As we noted in that evaluation, stiffness is a subjective factor. Personally, I find the original equipment Color Computer joysticks much too loose; on the other hand, I find the Spectrum Stick a bit too stiff for my liking.

The pushbutton, too, requires much more pressure than the one on the original equipment joystick. This also is a subjective factor; some people like a stiffer button.

Subjective factors aside, both the joystick and pushbutton should have a considerably longer life than the Radio Shack unit since they are made of higher quality components. On the other hand, the Spectrum Stick costs $39.95, exactly twice the cost of a Radio Shack Color Computer joystick.

Spectrum Stick is available from Spectrum Products, 93-15 86th, Woodhaven, NY 11421. ☐

Atari Strikes Gold

Owen Linzmayer

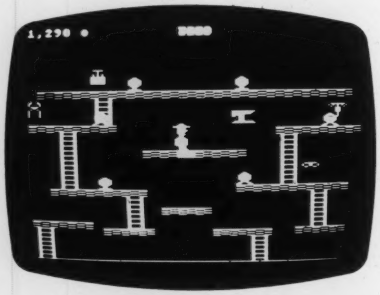
creative computing
SOFTWARE PROFILE

Name: Miner 2049'er
Type: Arcade
System: Atari 400/800 16K
Format: ROM cartridge
Language: Assembly
Summary: Excellent multi-level game
Price: $49.95
Manufacturer:
Big Five Software
P.O. Box 9078-185
Van Nuys, CA 91409

Big Five, one of the leading software producers for the TRS-80, has introduced its first Atari 400/800 arcade game, *Miner 2049'er.* When I heard that the folks at Big Five were attempting to write an Atari program, I was a bit skeptical. After all, these guys know the TRS-80, not the Atari. After playing *Miner 2049'er,* I realized that my worry was for naught—*Miner 2049'er* promises to be one of the most popular Atari programs in any software library.

Miner 2049'er is written entirely in machine language by the president of Big Five, Bill Hogue. The whole program is crammed into a huge 16K ROM cartridge.

When you first see *Miner,* you can't help making comparisons between it and Donkey Kong. *Miner 2049'er* is similar to Nintendo's coin-op game in that they are both multi-level games in which the player jumps and scuttles about on a building framework. From there on, *Miner* proves to be much more than a variation of Donkey Kong.



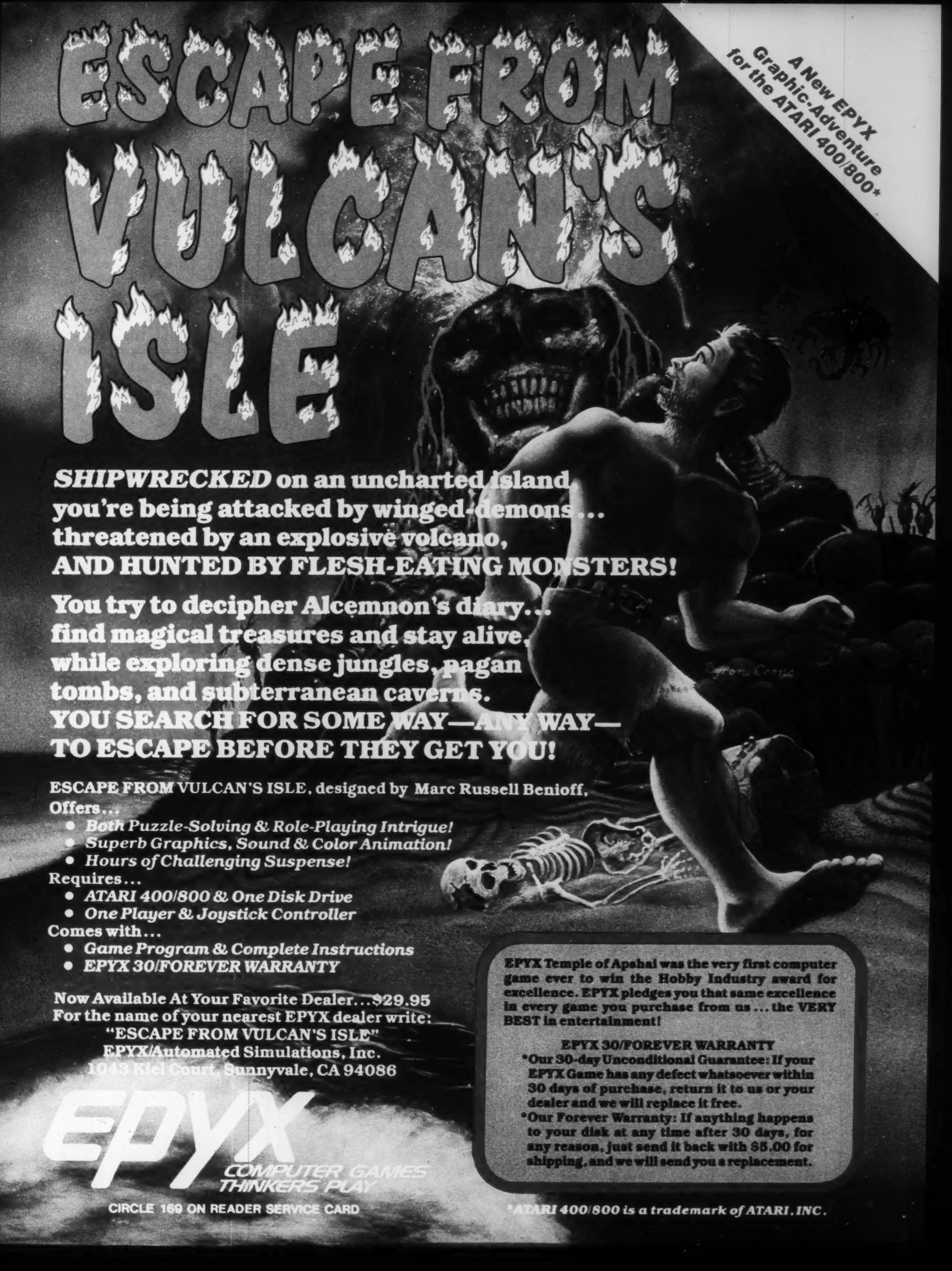
Whether you are playing a one- or two-player game, your character, Bounty Bob, is controlled using one standard Atari joystick plugged into jack 1. To move Bob left, right, up, or down, simply point the joystick in the appropriate direction. To jump straight up, press the red fire button. If you want to jump from one place to another, you must be moving in the direction you want to jump when you press the button.

Whereas Donkey Kong has only four screens, *Miner* has a stupefying ten separate boards, each with a different scenario. In general, the object is to control Bounty Bob and "claim" all of the mine stations. Whenever you walk along sections of framework in the mine, the pieces under your feet will turn solid in color. To claim a station and advance to the next one, you must fill in every section of framework.

Bounty Bob can die in a number of ways, the most common of which is to run into a mutant organism. These creatures roam the mines in hopes of making your visit a short one. Falling too great a distance will also prove lethal, as will miscalculating a jump.

In addition to the deadly mutant creatures, every mine station has specific hazards that you must avoid (such as pulverizers, explosives, and slides). Scattered throughout the mine are various articles that have been lost by previous expeditions. To grab these objects, simply touch them. Points are awarded, and for a short time the mutants will turn green. While green, a mutant dies if you touch it.

As if dealing with all of these dangers is not enough, poor Bounty Bob must also race against time. Located at the top center of the screen is the "Miner Timer." If this timer reaches zero, Bob dies. Should you complete the station be-



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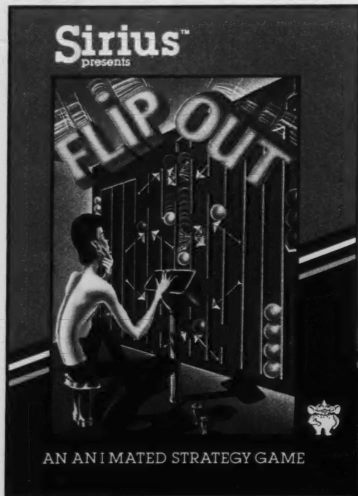

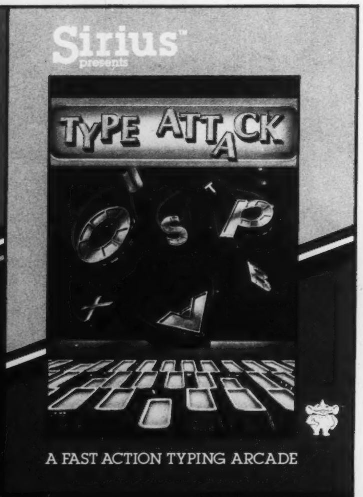

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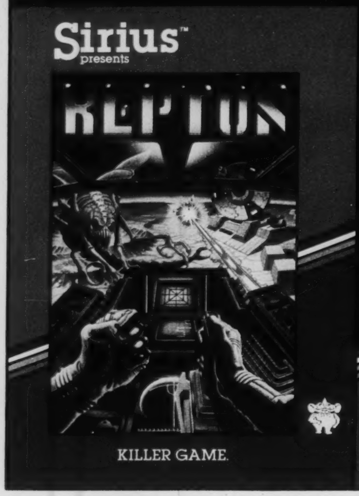

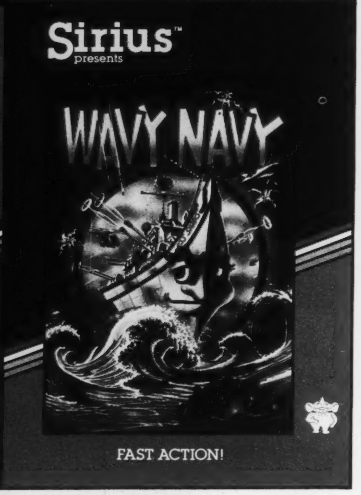

Talk about adventure on the high seas! You're blasting away at a squadron of enemy bombers and Kamikaze fighters from the deck of your P.T. boat. Suddenly you notice the sea is loaded with mines and an Exocet missile is screaming toward you on the horizon. Instinctively you jerk the joystick to the starboard, keeping your thumb on the fire button. Phew! That was close! Sometimes it's hard to believe Wavy Navy's just a video game.

New Games For Your Apple II From Sirius™

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For more information contact your local Sirius dealer or distributor or contact us at 10364 Rockingham Drive, Sacramento, CA 95827, (916) 366-1195.

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Miner 2049'er, continued...

fore time runs out, you are awarded the number of points remaining on the timer.

The limited sound effects are probably the weakest part of *Miner.* That is not to say that the audio is poor; it is just not up to the current standards for the Atari. Let's give a novice Atari programmer a little time to learn some of the better tricks for producing exhilarating sound effects.

The graphics in the game of *Miner* are detailed and very colorful. To guard against repetition, the color of the framework changes from station to station as well as from game to game. One of the most dazzling visual effects I have seen on the Atari is the animation of Bounty Bob dematerializing as he teleports from platform to platform using the elevators. *Miner* does not push the Atari to its full graphics potential, but it more than makes up for that in its limitless playability.

As mentioned earlier, *Miner 2049'er* has ten independent mining stations (game boards). The first three sections are fairly easy to complete with practice, but the game gets much more difficult after that. Luckily, Bill sent me a copy of *Miner* that allowed me to "skip" to any station I wanted. If I hadn't received this special version of the program, I doubt that I would ever have seen what lies beyond the fifth station.

> ***A multitude of stations and ever-increasing difficulty make* Miner *a game that is virtually impossible to master.***

If you are skillful enough to accumulate a high score, you can add your name to the high score table. Unfortunately, the scores disappear when you pull the cartridge from the slot.

A multitude of stations and ever-increasing difficulty make *Miner* a game that is virtually impossible to master. *Miner 2049'er* is a great game—no doubt about it. After reviewing Bill Hogue's first Atari program, I can't wait to see what he comes up with next.

In late October, plans were being finalized with a variety of other manufacturers to produce versions of *Miner 2049'er* for all of the most popular home computers and video game systems. Look for adaptations of *Miner* for the following: Apple II, TI 99/4, IBM-PC, TRS-80, VIC-20, ColecoVision, Atari VCS and Atari 5200. ☐

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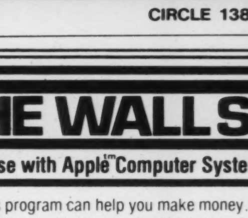

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International Computer Problem Solving Contest III

Donald T. Piele

Move over Pac-Man. Make way for the computer problem solvers. It is time once again to announce the Annual International Computer Problem Solving Contest sponsored by the University of Wisconsin-Parkside. This year's contest will be held on Saturday, April 30,1983. This is how it works.

The Structure

We provide the rules and the problems, and you provide the computers and the kids. A teacher from a school, an administrator from a school district, or an adult representing an organization may establish a contest site by submitting the registration form provided below. This person, the local contest director, agrees to abide by the rules of the contest and to conduct the local contest.

Larger groups, such as regional and state-wide computer education organizations, may also register to become contest sites. We especially welcome the opportunity to work with computer education organizations in administering the contest within a state.

Every contest director must appoint a contest duplicator. This person is someone who is not involved in the teachng or coaching of students participating in the contest. The contest duplicator is responsible for making the necessary number of copies of the contest problems and keeping them confidential until the day of the contest. We mail only one copy to each contest site.

Judges, who grade the local contest, are appointed by the contest director. We help out by providing grading guidelines including a complete set of sample solutions. Each local site is responsible for picking its own winners and making any local awards. For example, in our Southeastern Wisconsin contest, we award trophies to the top three finishers in each division. This is done at an awards ceremony held two hours after the programming is over. In the interim, the contestants attend our local computer fair sponsored by the UW-Parkside Computer Club.

Every contest director fills out and returns a summary of local results. If a team correctly solves four or more problems, copies of the programs and sample runs are also sent to us. Our team of judges compares the solutions from these teams and determines the top ten teams in each division.

The first place team in each division receives a traveling trophy engraved with the names of each team member. The other nine teams receive certificates of achievement.

The Rules

A team consists of one, two, or three students. All teams are classified by division. The Senior Division is for students in grades 10-12 (maximum age 18); the Junior Division is for grades 7-9 (maximum age 15); and the Elementary Division is for grades 4-6 (maximum age 12).

The contest is a timed event that challenges each team to solve as many problems from a set of five as they can within a two-hour time limit. Any computer system or computer language may be used; however, each team may use only one input device (keyboard/terminal). After the two-hour period, each team is allowed time to list its programs and sample runs to a printer.

The first thing the judges look for in examining a program is whether it runs correctly. If it does not produce the output specified in the problem, then the program receives a zero. If it does run correctly, then it receives 15 points. Additional points, from 1 to 5, are awarded for simplicity, style, and readability. The extra points are often necessary to distinguish between teams with the same number of correct solutions.

We realize that judging simplicity, style, and readability is a very subjective matter and that results may vary widely. Therefore, we examine the programs and make our own judgments of the results submitted for international ranking. We use one judge per problem to help ensure uniform treatment within each problem.

In general, no outside help, such as books or written or stored programs, is allowed during the contest. The only exceptions allowed are a text editor for writing the programs and a reference book or guide to the computer system and the language being used.

Our Support

This is the seventh year that we have conducted a programming contest in our area. It began as an experiment at our first annual University of Wisconsin-Parkside Computer Fair

---

Donald T. Piele, University of Wisconsin-Parkside, Box 2000, Kenosha, WI 53141.

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in 1977. Since then, we have held the contest locally each year, and two years ago we expanded it to its present international form.

After entering the contest, each contest director receives the following: 1) general information on how to organize the day's activities; 2) the rules; 3) the contest results form; and 4) contest problems and sample solutions from the two previous international contests.

Approximately two weeks before the day of the contest, the contest duplicator receives; 1) a copy of the official problems for all three divisions; 2) sample solutions; and 3) individual and master score cards. This material is duplicated locally and given to the contest director on the day of the contest.

Your Support

The size of each local contest varies widely. We have had schools enter with only one team consisting of the one student programming on the school's only microcomputer. This is fine with us. We are delighted to be able to challenge this one student. The only disadvantage with this format is that it precludes meaningful local recognition. We encourage contest directors to look around for other potential teams within the school or school district. A school district is probably the ideal size for a contest site big enough to make it competitive and small enough to be manageable.

The next size up is a statewide contest. Each school or school district can still hold the contest locally, but the results are returned to a state-wide organization to determine the top teams in that state. Any special recognition at this level is up to each state. We would like to get involved.

One logical organization would be the state chapter of the International Council for Computers in Education (ICCE). To find out whether your state has such an organization or how to start one if it doesn't, contact David Moursund, President, ICCE, Department of Computer and Information Science, University of Oregon, Eugene, OR 97403. (503) 686-4408.

We have also received requests from foreign countries asking for directions on how to organize the contest and recognize the winners within their own countries. One even suggested the possibility of having an international face-off among the top teams from each country.

What worked fine locally, seems to be doing just as well in other areas of the United States and in many foreign countries. Last year we received requests for information from over 400 sources representing more than 3000 students from 44 states and 16 foreign countries. If history repeats itself, we will double in size this year.

The Cost

In order to improve the administrative support that we feel is necessary to run this contest properly, we are charging, for

The University of Wisconsin–Parkside

3rd ANNUAL INTERNATIONAL COMPUTER PROBLEM SOLVING CONTEST

April 30, 1983

REGISTRATION FORM

1. **School or Organization** ______________________
2. **Address** ______________________
3. **City, State, Zip (USA) or Country (non-USA)** ______________________
4. **Contest Director** ______________ **Ph(** **)** ____-____
5. **Contest Duplicator** ______________ **Ph(** **)** ____-____
6. **Contest Site (circle one)** a) School b) School District c) State Organization d) Other________
7. **Circle all divisions for which a contest will be given:** a) Elementary b) Junior c) Senior

As Contest Duplicator, I agree to keep the contest problems and the sample solutions sent to me confidential until April 30 when I will turn them over to the Contest Director. I am not involved in any way in the preparation of student teams for the contest.

____

Contest Duplicator's signature

As Contest Director, I have read the rules of the contest and agree to follow them. I realize that I am responsible for conducting the local contest, having the results graded, and returning a completed Results Sheet supplied with the contest.

____

Contest Director's signature

Registration Fee: $4.00

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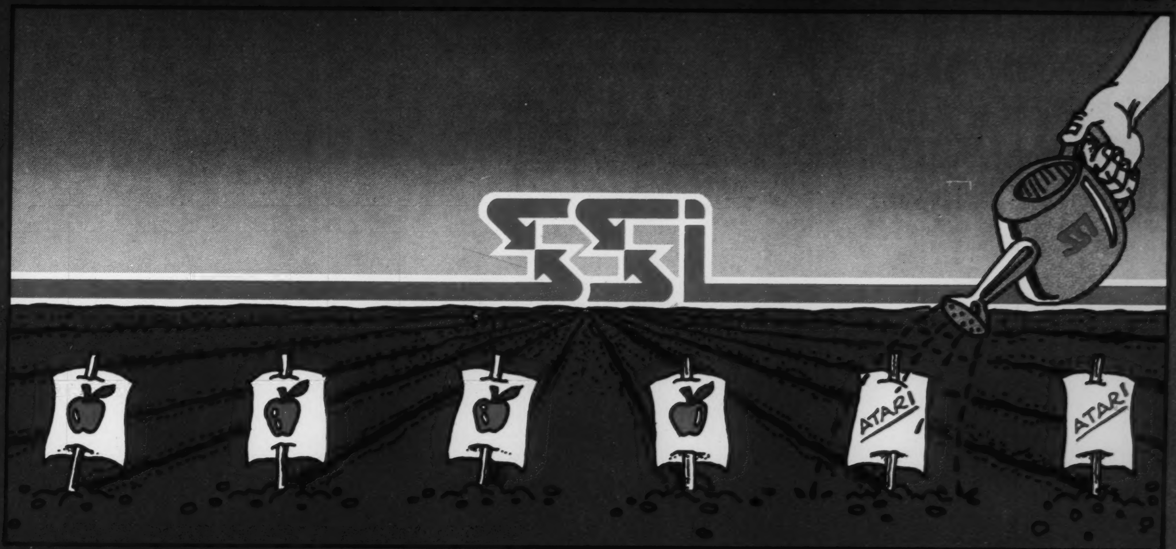

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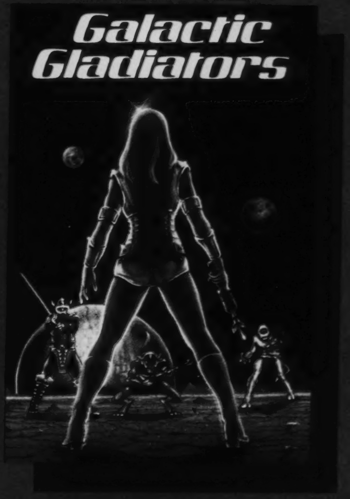

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the first time, a fee of $4 to each contest site. This fee will cover the cost associated with producing and mailing all of the contest materials; information, previous contest problems and solutions, results, certificates, and trophies.

Reflections

Organizing an international computer problem solving contest has been an educational experience. Through the contest results returned to us from schools throughout the United States and several foreign countries, we have been able to "feel the pulse" of the programming arm of computer literacy in pre-college education. Our sensors indicate very clearly that the exercise this arm is receiving through the spread of microcomputers into homes and schools is having dramatic effects.

Since we began the international event two years ago, it has doubled in size each year, as has the number of teams correctly solving four or more problems. Also, the myth that only computer freaks with one-dimensional personalities and offbeat interests can excel in computer programming is being exploded. The senior division winning team of Spencer Greene and Truman Joe from Klein High School in Spring, TX are perfect counterexamples.

Spencer and Truman became interested in computers in junior high school and started programming extensively in the ninth grade. In addition to computing, both have received many awards in mathematics and science.

For example, Spencer placed high in the University of Texas Interscholastic League's State Academic Meet; in the state and national Junior Engineering Technology Society competition; and in the University of Houston's 1982 engineering mathematics meet; and he also represented Texas as a team member to the 7th annual Atlantic Region Mathematics League Meet held in Washington D.C. He was also active in engineering club activities and served as vice-president of Mu Alpha Theta—Jets.

Truman has also participated in many of the same engineering and mathematics meets. He placed third in the mathematics/computer science division of the Science Engineering Fair of Houston and was offered a $12,000 scholarship for undergraduate work in engineering at the University of Houston. He served as president of the Junior Engineering Technology Society and was a member of the National Honor Society. He plans to pursue a career in medicine or engineering.

The senior division second place team of Jonathan Mark, Ian Taylor, and Washington Taylor from The Cambridge Rindge and Latin School in Cambridge, MA, was equally impressive. Ian Taylor was valedictorian of his senior class and is now at Yale University. Washington Taylor (no relation) was a member of the United States team to the 23rd International Mathematical Olympiad held in Budapest, Hungary.

The team tied for third place and Washington received an individual second place prize. He is now at Stanford University. Jonathan went to Harvard. All three were National Merit finalists.

Clearly, the programming arm of computer literacy is moving out of the backroom and becoming an acceptable and, indeed, desirable activity for a large segment of the pre-college population. Students who rank at the top in our contest are well rounded achievers with strong mathematical and scientific backgrounds. If the results of this contest proved anything, it was that in departments of mathematics around the country where computer problem solving is being incorporated into the curriculum, students are developing very strong problem solving skills.

Postscript

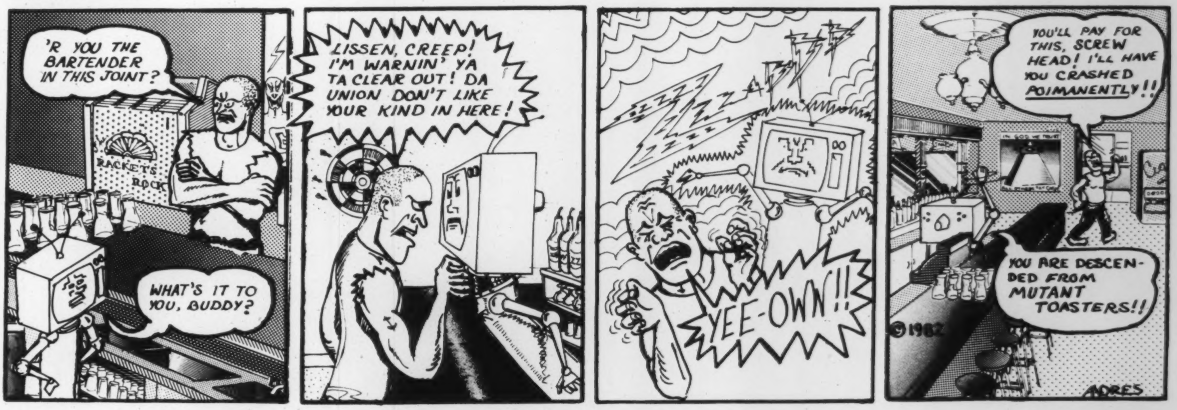
As usual, the date of the contest, April 30, is a Saturday. In the past this has caused problems for some schools that cannot use their school computers on this day or for whom it is a religious holiday. This year we are announcing an alternative date, Friday, April 29, for those sites that cannot possibly hold the contest on Saturday. This is the only alternative date that will be allowed.

Another problem for some teams is the language they are using. Although 99% of the teams in the contest use the Basic language, a few now use Pascal. Contest directors from these schools have noted that their teams cannot be competitive in a timed competition because of the extra time needed to compile the programs.

One suggestion for these schools is to look into the Computer Power curriculum materials developed at the University of Tennessee under a grant from the National Science Foundation. This package contains the program called Interpas which is an interpreter for Pascal. This program should give Pascal programmers the same ease of execution enjoyed by those using Basic. Contact the project director, Michael Moshell, Associated Professor of Computer Science, The University of Tennessee, Knoxville, TN 37916. □

Bit Pit

Chas Andres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ANDRES

Rebuilding Game Paddles and Joysticks

Tom Riley

This is the first of a series of articles on how to build controls for your personal computer. By control, I mean any device—from a super joystick to an airplane control wheel—that plugs into the paddle port of your computer. Step-by-step instructions will show you how to construct these projects successfully in a home workshop or high school shop.

The designs in the series will be limited to practical, easy-to-build devices that can be built from inexpensive, readily available materials. If you have put together an electronics kit and can do rudimentary soldering, you should have no difficulty with the electronics required for these paddles. If you can use hand tools and common power tools, you should be able to tackle the wood, plastic, and metal work.

Where to Start?

The easiest way to learn about paddles for the home computer is by rebuilding a commercial paddle or joystick. Why is this a useful training exercise and, in many cases, a necessary project? The primary reason is that commercial paddles, which may cost up to $60, are not very substantially built, and they don't stand up to the rigorous workouts they get.

Commercial paddles commonly fail because: wires are broken inside the cables, the connectors are bent or crushed, the potentiometer wipers fail to make contact, or the pushbuttons break mechanically. Few of these failures are electrical. Instead, virtually all failures are due to the breakage of weak parts that any competent designer would have seen were inadequate for their intended purposes. Fortunately, most of these breakdowns are easily diagnosed and repaired, and doing so provides a good lesson in basic electronics.

Types of Controls

I have an Apple II Plus computer; consequently, most of the controls in this series were designed and tested for that machine. I will attempt, however, to point out the changes in the designs that are necessary to adapt them for other computers whenever I have the appropriate information. Most home computers have similar electronic circuits for their controls.

Controls come in two general types, digital and analog. A digital control (found on the Atari) consists of a group of pushbuttons. An analog control, made up of potentiometers that can be adjusted uniformly over a range, is much more versatile.

Most of the projects in this series will feature analog controls, but I'll throw in a couple of digitals just for good measure. The various digital paddles are almost identical, but there are two distinct types of analog controls. They differ in the cost of their components and in their electrical wiring, and these differences will be pointed out.

A Wandering Mage Found These Paddles and Resurrected Them

Strange as it may seem, it is cheaper, and the final product is better if you rebuild paddles rather than buy new ones. Let's see what it would take to reconstruct a beat-up pair of Apple paddles and end up with better units than the originals. Let's assume that the cables have broken wires, the plug has a missing pin, and one of the pushbuttons and both of the potentiometers are broken.

The heart of the paddle is the potentiometer (pot), the electrical component that controls the adjustment range and that is located beneath the knob. The maximum resistance of the pot is measured in ohms; the Apple, unfortunately, uses a paddle pot with the value of 150K (K indicates thousands) ohms.

Pots of this value are somewhat hard to find. Other computer manufacturers use much more common values, like 100K ohms and 1 meg-ohm, for their paddle pots. In order to rebuild the paddles you will need to buy two new pots. (The information in the accompanying box demonstrates that it is possible, though somewhat complicated, to use lower values for the paddle pot.)

You can obtain decent linear taper pots from mail-order electronics houses or from local electronics supply stores that sell to the public (look for ads for the latter in the Yellow Pages). Radio Shack pots are of such poor manufacture that I cannot recommend them. Pots advertised as Mil Spec (military specification) are usually excellent, but the 150K value is rare.

A good pot will be completely sealed, will feel very smooth mechanically, and will be linear, i.e., a graph of the amount of turn versus resistance will be a straight line. Most good pots have

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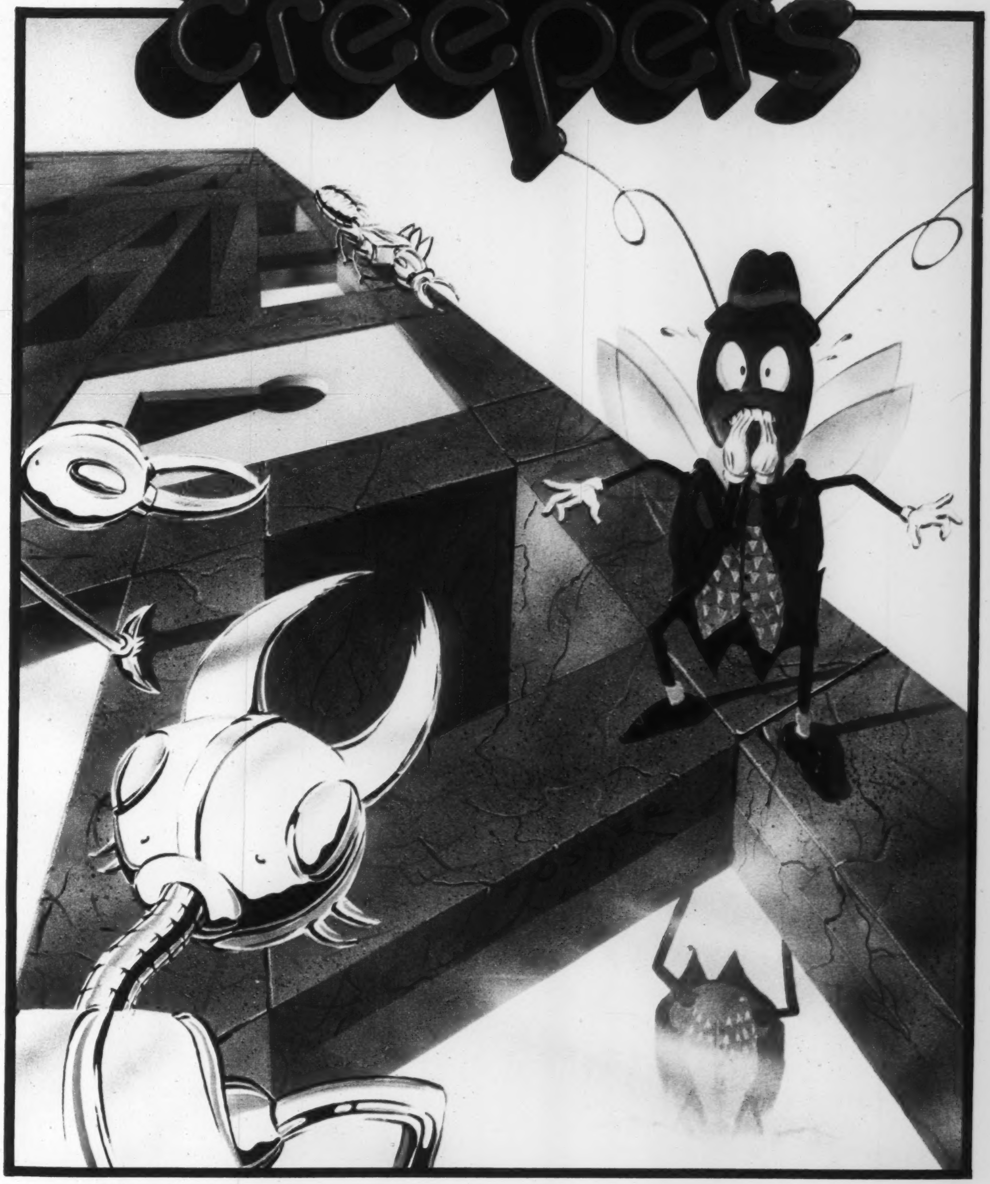

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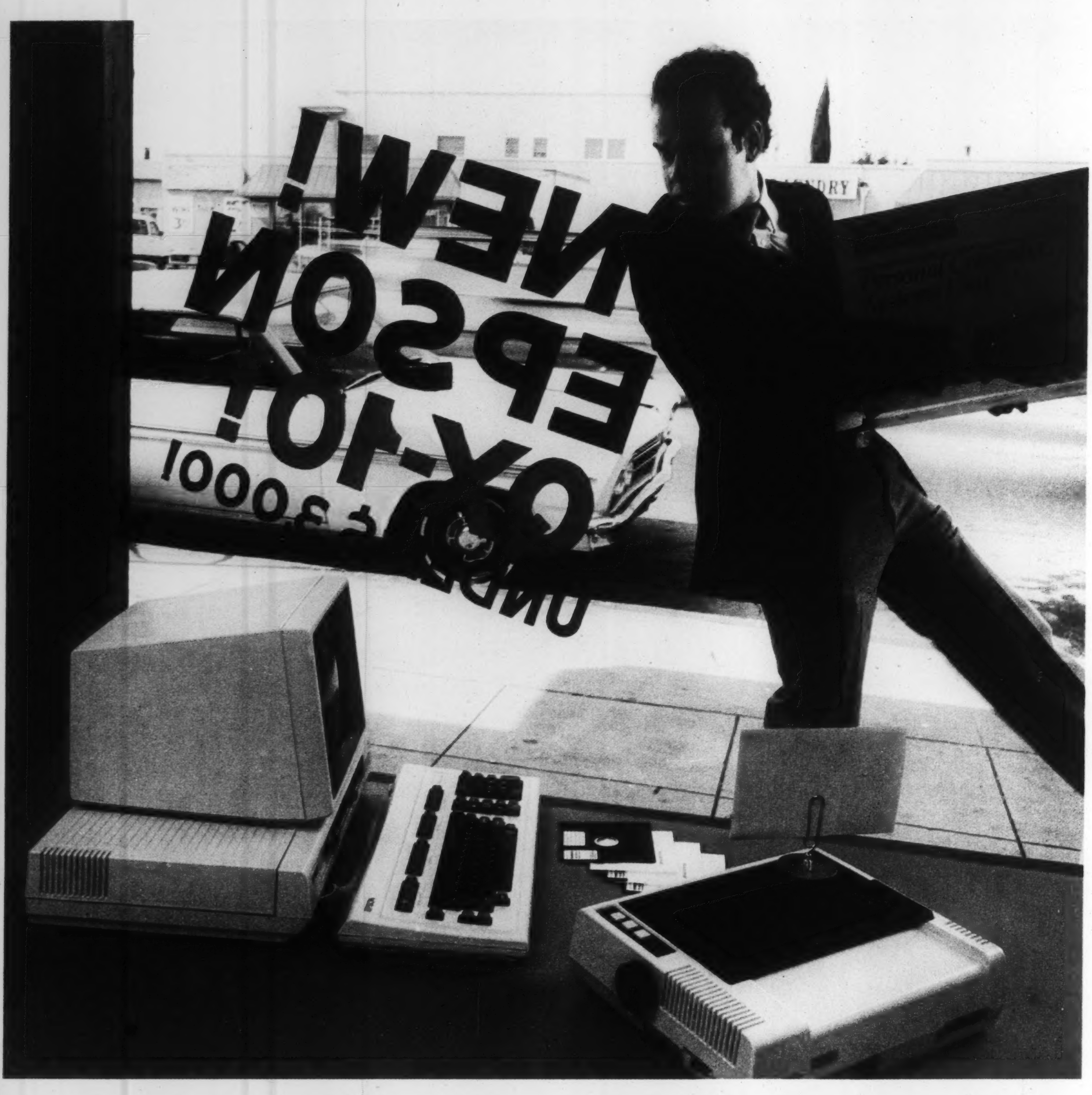
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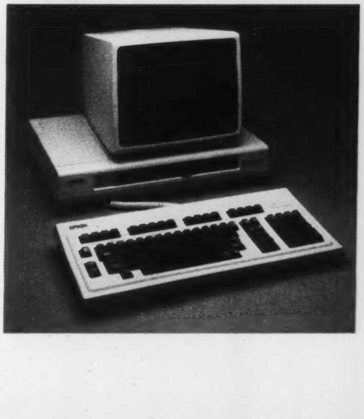

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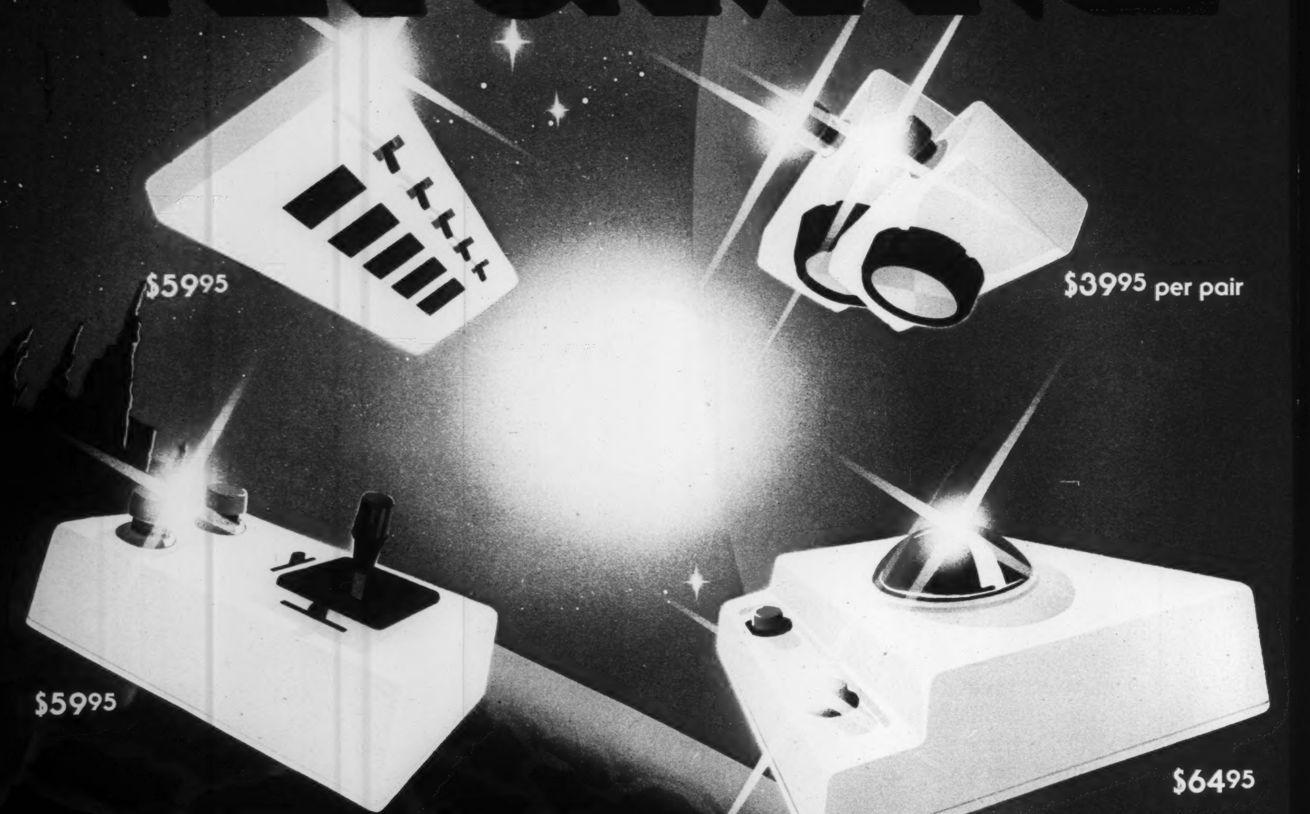

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quarter-inch round stems. If you want to use the knobs from the Apple paddle, you must file the shaft flat on one side.

The next item on our agenda is the paddle pushbutton, often referred to as the "fire" button. A good pushbutton should make a click that can be both heard and felt. The button should be about $^{3}/_{8}$" in diameter so that it doesn't tire the end of the finger to use it. A good quality pushbutton switch will cost up to $3. Many of the better ones are slightly larger than the originals, so you may have to enlarge or move the hole.

Since the index finger can control the fire button faster and more precisely than the thumb, you may want to move the switch to the back of the paddle where it can be pressed with the index finger when the paddle is held in either hand.

The cable is a critical component of the paddle. The wires can be quite small, but the cable must be mechanically sound and quite flexible. This project requires two cables (3-wire, 3-conductor), each about five feet long. I have found that telephone modular cable with four fine, multistranded wires is good for building paddles. (The Radio Shack product is satisfactory.) You can also weave several individual wires into a cable with a Boy Scout rope-making machine or pull #26 wires inside aquarium tubing. Both of these procedures have worked for me in various projects.

Replacing the plug is another important part of rebuilding the paddle. On the Apple, the plug is a standard DIP (dual inline package) plug. It can easily be made from a device called a header, or component carrier, at a cost of about $1.25. A header looks something like a standard chip, but has a row of tiny forks to which the individual wires are soldered. Whenever you are soldering on this device, plug it into a loose socket so that the pins will be held straight and will not loosen in the plastic.

The Mechanical Rebuilding

You will note in Figure 1 that several mechanical changes were made to the paddle case. First, the new pots were mounted and, if necessary, filed flat to accept the knob. The new switches were mounted in the original holes; you can relocate them if desired. Paper labels with the 1 and 0 clearly marked were put on the front of the case and covered with transparent tape. To indicate the amount of turn, a line was drawn on the knob with a felt-tip marker.

To give the paddle a solid feel, I glued weights into the bottom half of the case. I used lead wheel weights (these fall off automobile wheels) that I found while bicycling. You can, of course, get them from any place that balances tires. Such weights can be installed with either epoxy or silicone sealer. I covered the bottom of the paddle with felt, attaching it with rubber cement, to further improve the feel and insure that the paddle will not scratch furniture. In addition, it may be necessary to enlarge the notch for the cable, particularly if you use telephone cable.

The Electrical Wiring

Figure 2 shows the standard schematic for an Apple paddle. You may wish to refer to page 100 of the *Apple II Reference Manual* for more detail. Note that two resistors from the original paddle, with a value of 570 ohms each, are mounted in the game connector. You may use resistors of any value from 570 to 1000 ohms, rated at $^{1}/_{4}$ watt and 5% tolerance.

The soldering should be done with a small pencil-type iron of from 25 to 42 watts and resin-core solder. The use of acid-core solder on electronic equipment will destroy it forever and always—no resurrection is possible.

Check and Double Check

The professional procedure for making up a circuit from the schematic requires two photocopies of the schematic drawing and a colored pencil. As you

Figure 1.

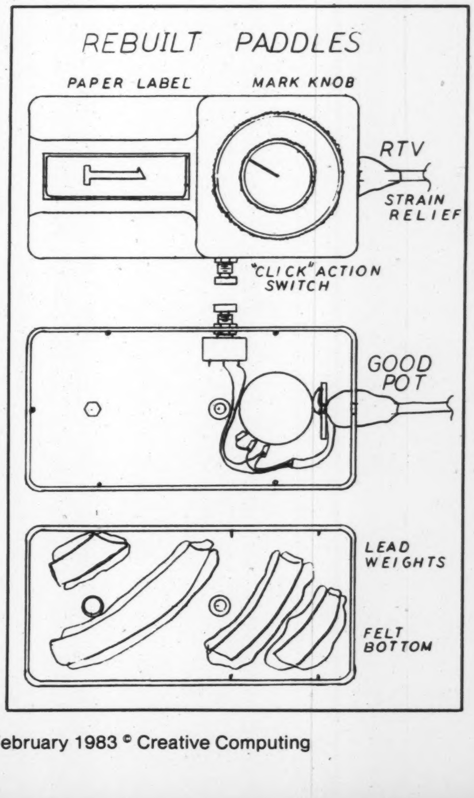
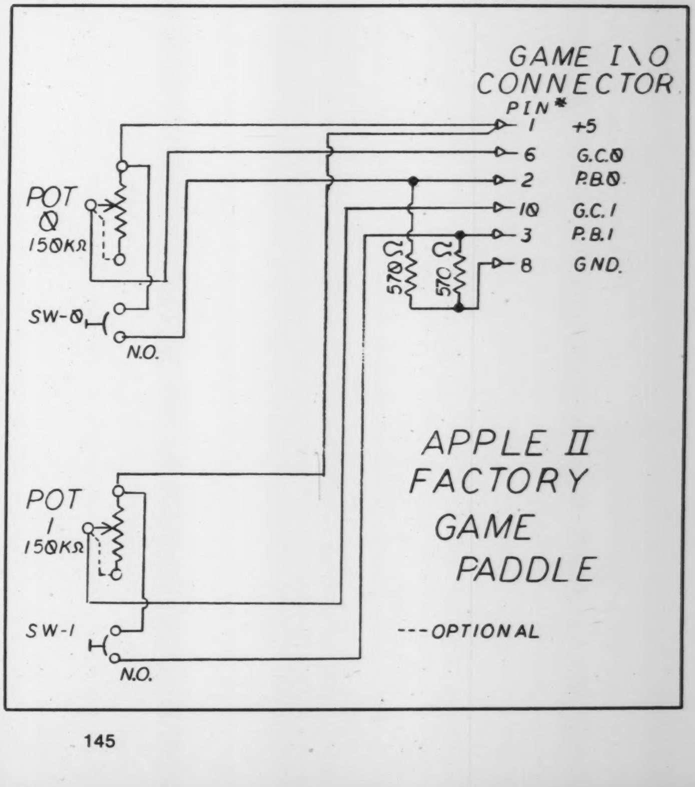
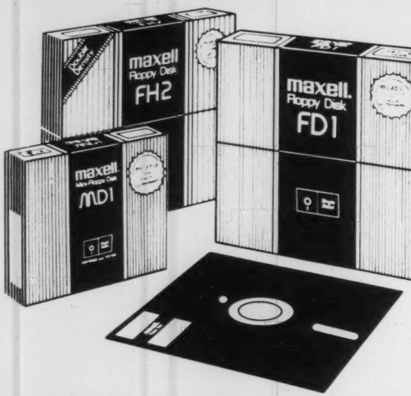


Figure 2.





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solder the connection, you neatly color in each connector and wire on the first copy of the schematic. When everything is neatly colored in, you are finished.

The second copy is used for the test. When you think your work is complete, you take the fresh copy of the drawing and, with a multimeter, carefully check each line for continuity, coloring it in on the drawing once again. You will find that is is very easy to miss soldering a wire or two.

You may want to unbolt the potentiometer and the pushbutton to make soldering easier. Cut the cables to length and very carefully strip back the outer insulation. Be especially careful not to nick the wires. A small pair of wire strippers, the type that look like pliers and have an adjustment bolt, are best for this job.

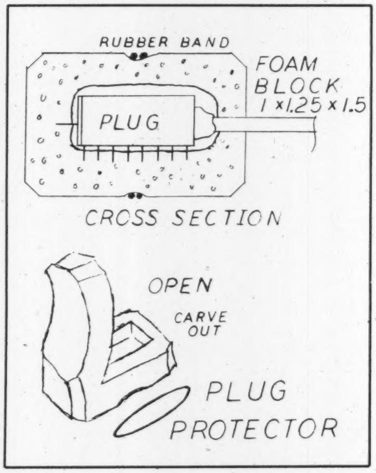

Figure 3.

If you use telephone modular cable, you will find that you have four wires, one more than is necessary. It is best to double up and use two wires for the line from pin 1, the +5 supply, which goes to one side of the pot and one side of the switch. This reduces the chance of the pushbutton affecting the pot reading.

You will note that Figure 1 also shows a jumper between the unused leg of the pot and the center terminal. This is considered good electronic practice and helps performance somewhat when the pot begins to wear. If the pushbutton has three terminals, be sure to use the pair marked "common" (C) and "normally open" (N.O.).

To attach the header, strip back the insulation from the cable and expose the wires, trim them neatly to the length required, and tin about ⅛" of bare wire on each with solder. Plug the header into an empty socket and locate the mark for

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pin 1. The cables usually are fed in from the pin 8 end to make them easy to plug into the Apple. Now you can fit the wires into the tiny forks, hold them with a pair of long-nosed pliers, and solder.

Clip off the excess wire with a small pair of diagonal cutters (dikes). Place the two resistors (called pull-downs) into the header, shortening and bending their leads to fit the forks precisely. Hold wires with long-nosed pliers, not your fingers, while you are soldering.

If you have a multimeter, you can now check out your work without the risk of plugging it into the computer. Put it on a low-ohms scale and measure for continuity between the pins on the connector and the appropriate points indicated in Figure 2. In addition, measure from pin 1, the +5 supply, to pin 8, the ground, to insure that impedance is greater than 50 ohms, and that it remains greater for all settings of the pot and all pushbutton combinations. It is a good idea to have a friend check your work for you. In any case, checking it three times usually insures correctness.

The Smoke Test

It is now time to turn off your computer. Never attach or remove anything from a computer with the power on. Check again for your #1 pin, properly plug it into the paddle connector, and then turn the computer back on. If the computer behaves in any manner irregularly, *turn it off immediately,* unplug the paddle, and recheck all work. As an example of irregular behavior, if the disk routine starts up over and over again, it indicates a short to the +5 pin.

If nothing untoward happens, you can run the program given in Listing 1 to check out the functions of the paddle and the pushbuttons. If all is well, turn off your computer and remove the paddle connector.

Finishing Up the Job

The next task is to install the bottoms on the paddles and build up a strain relief for the cables out of silicone sealer. This material, used for bathroom caulking, is available at most hardware stores. The clear sealer is best for electronics work since it is the least messy. (This material is quite irritating if it gets on your skin or in your eyes, so be careful using it.) You may have to apply two coats of sealer to get a neat result. Allow each coat to dry overnight.

A Final Touch

One of the most common problems with Apple paddles is bent pins in the connector. This isn't a failure in the design; computer users simply leave them lying around unprotected. Figure 3 shows a protective foam block for the connector that may be used whenever the paddle isn't attached to the computer. Your best choice is the stiff but flexible white foam that is used to pack delicate electronic equipment. This foam is easily worked with a pair of scissors. A rubber band holds the foam block in

Listing 1.

```
10  REM  *** PADDLE CHECK OUT
20  REM  **    J.T. RILEY  12/12/
     81
30  TEXT : HOME
40  VTAB 2: HTAB 6
50  PRINT "PADDLE CHECK OUT - APP
     LE II"
60  VTAB 6
70  PRINT "    THIS PROGRAM IS TO
      TEST PADDLE "
80  PRINT "PUSH BUTTONS AND POTS.
     "
90  PRINT
100  VTAB 10: HTAB 8: PRINT "PB0
     IS "
110  VTAB 12: HTAB 8: PRINT "PB1
     IS "
120  VTAB 14: HTAB 8: PRINT "PB2
     IS "
130 OP$ = "OPEN  ":CL$ = "CLOSED"
     :BL$ = "      "
140  VTAB 17: HTAB 14: PRINT "PDL
     (0) = "
150  VTAB 18: HTAB 14: PRINT "PDL
     (1) = "
160  VTAB 19: HTAB 14: PRINT "PDL
     (2) =  "
170  VTAB 20: HTAB 14: PRINT "PDL
     (3) = "
190  FOR I = 10 TO 14 STEP 2: VTAB
     I: HTAB 15: PRINT OP$: NEXT

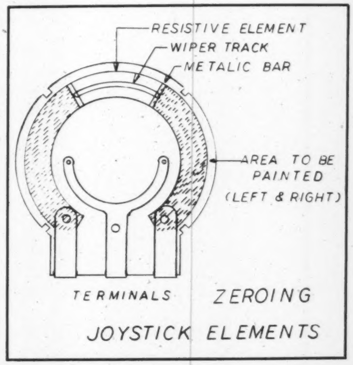
200  REM  ** TEXT LOOP
210 P0 =  PEEK ( - 16287)
220 P1 =  PEEK ( - 16286)
230 P2 =  PEEK ( - 16285)
237  VTAB 10: HTAB 25: PRINT BL$;
     : HTAB 25: PRINT P0
238  VTAB 12: HTAB 25: PRINT BL$;
     : HTAB 25: PRINT P1
239  VTAB 14: HTAB 25: PRINT BL$;
     : HTAB 25: PRINT P2
250 G0 =  PDL (0)
252  FOR I = 1 TO 10: NEXT I
255 G1 =  PDL (1)
257  FOR I = 1 TO 10: NEXT I
260 G2 =  PDL (2)
262  FOR I = 1 TO 10: NEXT I
265 G3 =  PDL (3)
270  FOR I = 17 TO 20: VTAB I: HTAB
     23: PRINT BL$: NEXT I
280  VTAB 17: HTAB 23: PRINT G0: VTAB
     18: HTAB 23: PRINT G1: VTAB
     19: HTAB 23: PRINT G2: VTAB
     20: HTAB 23: PRINT G3
290  IF P0 > 127 OR P1 > 127 OR P
     2 > 127 THEN  GOTO 300
294  FOR I = 10 TO 14 STEP 2: VTAB
     I: HTAB 15: PRINT OP$: NEXT
```

Zeroing Joystick Elements

A common failure of joysticks, particularly cheap ones, is not to go to zero. This can be corrected, but the procedure is tricky, and you can ruin the joystick element. If you decide to attempt the correction, first unsolder and disassemble the joystick element and remove the potentiometer. The metal back must then be removed from the pot by straightening the small metal tabs. These tabs will not bend very many times before they break. In removing the back be careful not to lose any of the internal parts.

The pot element now should look like Figure 4. Note that there is a small active area of resistive element in the middle and two large inactive areas on either side. The problem is that the inactive areas have too much resistance to read as zero. Look closely at the limits of the wiper track, which leaves a mark in the active area.

Figure 4.



The trick is to reduce the resistance of the inactive areas. This can be done by painting over them with sterling silver-pigmented paint, available at electronics stores, or with a homemade paint made from clear nail polish and lock graphite. Needless to say, the expensive silver paint is better.

Carefully wipe clean the inactive areas. Make up a mixture of nail polish and graphite into a paste on a smooth surface, then paint the inactive area of the pot element, covering the terminal end and continuing until you just touch the end of the wiper track. Be very careful that the paint goes nowhere else, particularly where it might touch the metal case or the metal feelers for the central terminal. It may take two coats for complete coverage; allow the paint to dry thoroughly.

Now reassemble the pot and the joystick element. Resolder the wires according to the schematic. Run the check-out program. If correction caps were used you may have to adjust their value. ☐

place. A loose socket may also be used to protect the pins.

Joysticks

Most of the procedures we use in reconstructing a paddle can also be applied to a joystick. You can obviously replace the connector and the cable. In this case, the cable will require more conductors: four conductors if there is one pushbutton, five if there are two, and six if correction capacitors (caps) are required. A double run of the modular telephone cable with stranded wires works much better than the commonly used ribbon cable. There is usually plenty of room in the joystick case to install new pushbuttons; it is just a matter of matching holes.

The joystick element containing the two pots and the mechanical linkage is more difficult to replace. It is almost impossible to find replacements for just the pots. The commonly available replacements for the entire element are not very good. You may also have to use pot values other than those originally intended and add the correction caps as indicated in the accompanying box. Joystick elements with centering springs and tabs are usually better made than those without.

One of the special problems that occurs with joysticks is failure to zero. There is a procedure to correct this problem, described in the box on "Zeroing Joystick Elements," but it is difficult to complete successfully.

Be sure to provide proper strain relief for the cable where it exits from the box. Broken wires at this point are often seen on ribbon cables.

Summing Up

As we have seen, it is possible to take worn or damaged paddles and joysticks and rebuild them into devices that are sturdier and better functioning than manufacturers' originals. Rebuilding a paddle is an excellent beginning project in electronics and costs less than replacing the unit.

Your experience in rebuilding paddles can serve as a base for the construction of more sophisticated additions to your home computer. In the next article we will look at the design for an airplane control wheel for flight simulators. Fashioned from wood and sheet metal, it isn't difficult to construct, and it is different from anything on the market. ☐

Listing 2.

```
10  REM  *** CAP ADJUSTMENT CALCULATION
17  REM  POT & CAP VALUE
18 RMX = 150:CI = .022:K = RMX * CI
20  TEXT : HOME
30  VTAB 2: HTAB 5
40  PRINT "CAPACITOR ADJUSTMENT CALCULATION"
45  VTAB 4: PRINT "          FOR APPLE II"
50  VTAB 6
60  PRINT "   FOR THE PADDLE POT TO WORK PROPERLY,"
70  PRINT "A TIMER IT CONTROLS MUST WORK PROPERLY."
80  PRINT "THE TIMER IS CONTROLED BY A CAPACITOR"
90  PRINT "AND THE POT IN THE PADDLE WIRED AS A"
100  PRINT "VARIABLE RESISTOR"
110  PRINT
120  PRINT "    THE PRODUCT OF THE CAPACITOR AND"
130  PRINT "THE MAXIMUM RESISTANCE MUST REMAIN THE"
140  PRINT "SAME.  CORRECTION CAPS MAY BE ADDED"
150  PRINT "IN SIDE THE PADDLE."
160  PRINT
170  HTAB 6: PRINT "MAX. POT. RES. >       K-OHMS";
175  HTAB 22: INPUT " ";R
177 L =  PEEK (37): VTAB L: HTAB 29: PRINT "K-OHMS"
180  IF R > RMX THEN  GOTO 300
190  IF R = 0 OR R < 0 THEN  PRINT "POT VALUE MUST BE GRATER THAN 0": GOTO
     160
200 C = K / R - CI
205 C =  INT (C * 10000 + .5) / 10000
210  PRINT "CORRECTION CAP IS ";C;" MICROFARADS"
220  GOTO 160
300  REM  HIGH POT VALUE SUB
310  PRINT
320  PRINT "CAP CORRECTION DOES NOT WORK ABOVE ";RMX;" K"
330  PRINT "A CORRECTION RESISTOR FROM +5 TO WIPER"
340  PRINT "MAY HELP BUT THE RESULT IS NOT LINEAR."
350 RC = (R * RMX) / (R - RMX)
355 RC =  INT (RC * 10) / 10
357  PRINT
360  PRINT "     CORRECTION RESISTOR > ";RC;" K-OHM"
370  GOTO 160
999  END
```

Correction Capacitors

One of the most common means of reading paddles is by the use of a timer circuit. You can tell if this is the procedure used by a computer by counting the wires from the paddle pot back to the computer. If there are two wires (+5 and pot wire), then the pot is wired as a variable resistor and is used in a timer. If there are three (+5, ground, and pot wire), then the pot is used as a variable voltage device, or true potentiometer. The Apple, Commodore Vic and many other machines use the timing circuit. Some Radio Shack models use true potentiometers.

The timing circuit can be adjusted for pot values lower than the original values. This adjustment can be made by adding small capacitors within the paddle, thus requiring no modification of the host computer.

Listing 2 is a Basic program to assist you in calculating the correction cap values for the Apple II. The program works by taking the maximum value of the pot and multiplying it by the value of a small cap inside the computer to form a constant. You then divide that constant by the new maximum pot value and subtract the original cap value to obtain the correction cap required.

For the Apple the original maximum pot value was 150K ohms. The original cap is a .022 microfarad. If you have a different computer you can probably get the maximum pot value by opening a paddle and either reading the value off the pot or measuring it with a multimeter. You can usually find the cap on the schematic by tracing the wires from the paddle port back into the machine. These values can then be placed in line 18.

The correction caps are soldered from the game control pin to ground. If they are put inside the paddle, you must bring a ground wire out to the paddle. They may also be mounted on a small printed circuit board a few inches down the cable from the connector and encased in packing foam.

It is difficult to obtain the exact values desired, so you are probably just as well off to buy an inexpensive selection of caps and use trial and error.

To test your work, run the paddle check out program (Listing 1). If the reading reaches 255 before the pot is turned to its maximum, the cap is too big. If the reading never reaches 255, the correction cap is too small. Several small caps in parallel may be needed to get the correct value. The cap adjustment program contains the limitations of this procedure. ☐

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Fin-Apple Ratios

Analyzing Financial Ratios with the Apple

William J. and Paula K. Purpura

The program described here was written to provide a convenient tool for financial ratio analysis. Financial ratio analysis can be made easier when a computer performs the repetitive calculations.

This program is designed to take standard and commonly available information, (such as balance sheets, income statements, and stock price data) and automatically generate sets of the most frequently used financial ratios. These ratios are useful in determining the financial health and prospects of a firm, in performing trend analysis, and for comparing one firm with another.

It should be noted that it is for just these purposes, that Dun and Bradstreet publishes such ratios for entire industries.

The program makes it possible to test the effects of various circumstances quickly by comparing before and after ratios. The program is menu-driven to aid the user in its operation.

Readers who already have an understanding of financial ratios may skim the next sections, which provide descriptions of the various ratios calculated by the program. To help those new to financial ratios, a single example will be used throughout the article. Following the tutorial section is a section discussing a few important points about program operation.

Peter Piper's Pickle Packing Plant

Peter Piper's Pickle Packing Plant will be used as an example of how the various ratios can be used and interpreted. The example can also be used to verify correct operation of the program after you have entered and de-bugged it.

Peter Piper is an energetic young businessman who became interested in pickles as a boy when he picked a peck of pickled peppers. He started his own pickle packing plant five years ago, and has developed the Peter Piper brand of pickles into a highly respected name. Peter sells his pickles directly to grocery stores in the area under his own name.

Peter Piper's income statement and balance sheet for the current year are shown in Figures 1 and 2.

About Financial Ratios

Ratios are a means of expressing the relationship between numbers for comparative purposes. Ratios are usually expressed as percentages. For example, Peter Piper may be interested in knowing the proportion of pickles packed which are of acceptable quality. A useful measure to Peter then would be the ratio:

$$\frac{\text{Total Number of Good Pickles Packed}}{\text{Total Number of Pickles Produced}}$$

This ratio gives Peter the percentage of good production. If this ratio should change periodically, it can be a clue to production problems or other changes. Similarly, financial ratios can be used to present actual operating figures in a more easily understood format.

Such ratios can be used to spot financial trends and operating problems. They can be useful in comparing different business units (i.e., divisions or companies), as the relative sizes of the organizations involved are factored out. Many firms use financial ratios to state their budgetary goals or to evaluate managerial performance. Ratios are a widely used and versatile tool for financial analysis.

The ratios represented in this program fall into six categories: liquidity, leverage, activity, profitability, coverage, and stock ratios. Each set of ratios is displayed separately by the program, and will be discussed individually below. Those ratios which are published by Dun and Bradstreet as KEY ratios, will be noted in this article by the symbol DB. The program output automatically flags these KEY ratios.

Liquidity Ratios

Liquidity ratios compare a firm's current assets (such as cash, accounts receivable, inventory, etc.) to current liabilities (such as short-term debts, accounts payable, etc.). These ratios give the analyst indications of the firm's ability to meet its short-term obligations, and point out inappropriate balances between current assets and liabilities.

In addition to the ratios listed below, the liquidity ratio section also calculates Net Working Capital (i.e., current assets less current liabilities).

Note that the information presented below follows a format which will be used throughout this article. First, the ratio will be defined, followed by a description of what that particular ratio indicates. Second, the ratio for Peter Piper's Pickle Packing Plant, as calculated by the program, will be presented together with an explanation of its significance.

$$\text{DB 1. Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

This ratio measures the firm's ability to meet its short-term obligations. For most firms, the value of the ratio should be between 1.5 and 4. Values beyond these limits may indicate that the firm will have difficulty meeting its short-term bills, or that short-term assets are not being well used.

Peter Piper's current ratio is 3:83. Since this ratio is high, we suspect that Peter will not have trouble meeting his upcoming bills (accounts payable and notes payable). We should note that the ratio is so high, that Peter could probably use his current assets in the business, instead of letting them collect interest in the bank.

$$\text{DB 2. Inventory to Working Capital} = \frac{\text{Inventory}}{\text{Current Assets} - \text{Current Liabilities}}$$

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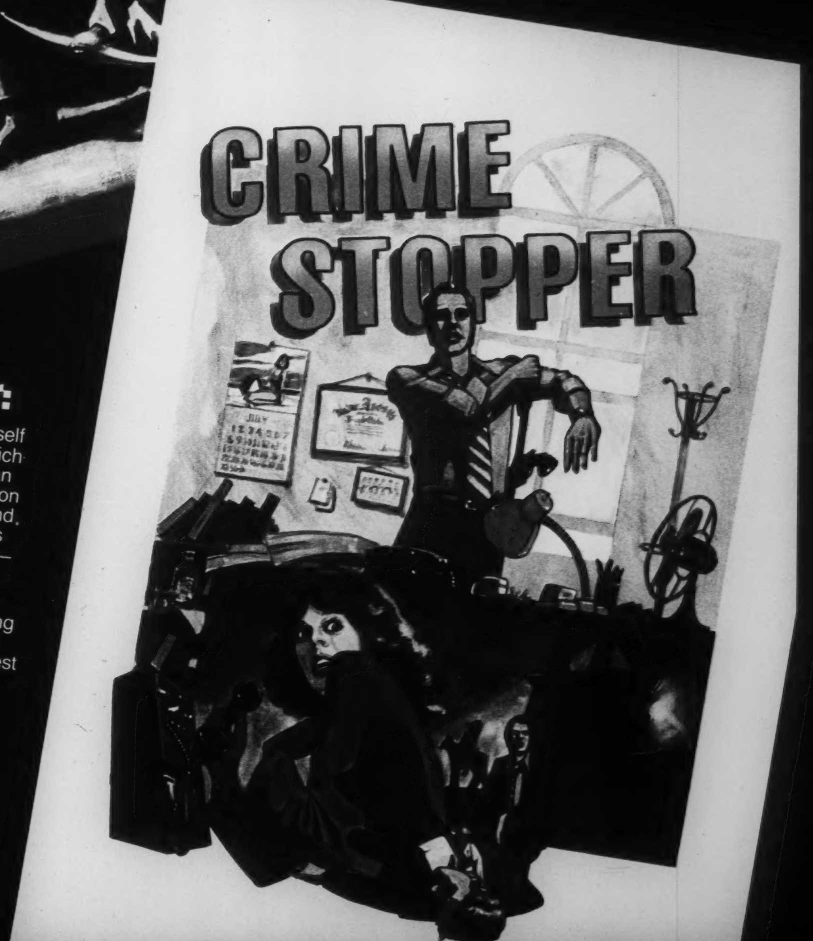

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Fin-Apple Ratios, continued...

The intensity of the firm's involvement with inventory is shown by this ratio. If the ratio is too high, it may indicate that the firm cannot raise money quickly in an emergency. If the ratio is too low, it may indicate that the firm cannot meet the needs of its clients quickly. The range for this ratio depends upon the industry in which the firm operates, as service industries will typically have less inventory than manufacturing or industrial organizations.

Consider Peter, our friendly neighborhood pickle packer. Peter's inventory to working capital ratio is 0.61, which is probably neither too high nor too low. Since we already know (from the current ratio) that Peter has a lot on current assets, it becomes obvious that he does not have all of them in the form of inventory. He does apparently have enough stock on hand though to satisfy his customers' needs. Peter seems to have achieved a good balance between inventory and working capital.

DB 3. Current Debt to Inventory $= \dfrac{\text{Current Debt}}{\text{Inventory}}$

The firm's dependence on funds generated by selling inventory is measured by the current debt to inventory ratio. A high ratio indicates that in an emergency, the firm would have little cash available to meet obligations, since inventory is not a liquid asset. It is more favorable to have a lower ratio, which indicates that the firm would not have to try to liquidate its inventory in such an emergency.

Again, in Peter's company, we can see that there is not an excess of inventory. Peter's ratio is 0.57, which is probably a little low for a manufacturing firm. This ratio, together with the inventory to working capital ratio, indicates that Peter will probably not have to try to liquidate his inventory in the event of a cash crisis.

DB 4. Quick Ratio $= \dfrac{\text{Current Assets} - \text{Inventory}}{\text{Current Liabilities}}$

The quick ratio estimates the firm's ability to get cash quickly in an emergency. A firm which has a high percentage of its current assets tied up in inventory will be less able to pay its obligations than a firm which has its assets in more liquid form.

Peter has a high quick ratio of 2.09 and would have little trouble meeting his obligations in an emergency. We can see again that having a low inventory level leads to favorable liquidity ratios.

5. Net Working Capital = Current Assets – Current Liabilities

Net working capital is not a ratio by definition, but it is a frequently used measure for estimating the liquidity of a firm. This value indicates how much of the firm's assets are required to meet short-term obligations and how much is left over for running the business. Net working capital is automatically calculated by the program, and provided with the miscellaneous information.

Leverage Ratios

Leverage ratios compare the balance between a firm's debt and its ownership. Up to a point, the tax advantages of debt can reduce the firm's operating costs, and equity (or ownership) increases the firm's financial stability. The balance between debt and equity is very important to lenders and owners of the firm, and also gives an indication of the firm's management style.

DB 1.

Total Debt to Net Worth $= \dfrac{\text{Current and Long} - \text{Term Debt}}{\text{Tangible Net Worth}}$

This ratio provides a direct comparison between debt and equity. If the ratio is high, it indicates that the firm has many contractual obligations to pay out its money to creditors. Thus, there will be less money available for operating and paying the

Figure 1.

Peter Piper's Pickle Packing Plant
Income Statement
(All figures in thousands)

Net Sales	$3500
Cost of Goods Sold	(2040)
Gross Profit	1460
Operating Expenses	(1300)
Gross Operating Profit	160
Depreciation	(60)
Net Profit from Operations	100
Other Income	34
Gross Income	134
Other Expenses	(14)
Net Income before Taxes	120
Taxes	(50)
Net Income after Taxes	70
Dividends	(55)
Addition to Retained Earnings	15
Previous Retained Earnings	925
Current Retained Earnings	940

Figure 2.

Peter Piper's Pickle Packing Plant
Balance Sheet
(All figures in thousands)

Assets	
Cash	$180
Accounts Receivable	590
Allowance for Bad Debt	(13)
Inventories	645
Prepaid Insurance	18
Total Current Assets	1420
Machinery and Equipment	450
Depreciation Allowance (M & E)	(290)
Building	400
Depreciation Allowance (Bldg.)	(185)
Land	24
Total Fixed Assets	399
Goodwill	10
Total Assets	$1829

Liabilities and Equity

Accounts Payable	153
Notes Payable	90
Accrued Taxes	127
Total Current Liabilities	370
Bonds Payable	19
Total Long-Term Liabilities	19
Total Liabilities	389
Common Stock	500
Current Retained Earnings	940
Total Stockholders' Equity	1440

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owners of the firm. There is no single ratio value which will be high for all firms. The nature of the industry, general economic conditions, and the preferences of the firm's management will all affect the suitability of a given value of this ratio. Note that "tangible net worth" is defined as the sum of all outstanding stock (both preferred and common) and retained earnings less the value of any intangible assets.

Peter's total debt ratio is 0.79. This is certainly not a low ratio, as it indicates that every dollar invested in Peter's Plant has been encumbered by an additional $0.79 in debt. Whether or not this ratio is too high is dependent upon many factors.

For example, if the current economic conditions Peter faces include a high inflation rate and a reasonable interest rate, it may make sense for him to have a large amount of debt. This ratio also indicates that Peter is not a particularly conservative manager, as such managers tend to avoid high levels of debt.

DB 2. $$\text{Current Debt to Net Worth} = \frac{\text{Current Debt}}{\text{Tangible Net Worth}}$$

The intensity with which the firm uses short-term debt is measured by this ratio. As with the previous ratio, high values depend on environmental factors and opinion. This ratio provides a better indication of the short-term position of the firm than does the total debt ratio.

The Current Debt to Net Worth ratio for Peter's Pickle Plant is 0.75. This is somewhat alarming, as it means that Peter not only has a fairly high level of total debt (as seen in the previous ratio), but most of that debt has to be paid off during this year. This is probably the reason that Peter has so much cash available; he will need it to pay off his current liabilities.

DB 3. $$\text{Fixed Assets to Net Worth} = \frac{\text{Fixed Assets}}{\text{Tangible Net Worth}}$$

The fixed asset to net worth ratio guages the firm's use of its fixed assets. The ratio is very dependent upon the nature of the organization for useful interpretation. Capital intensive industries, such as heavy manufacturing, will have much higher ratios than service industries, which generally have little need for capital involvement.

A low ratio many indicate that the firm will have to acquire more fixed assets to operate effectively. A high ratio can be a problem also, indicating that the firm may not be using the assets it already has.

Peter's fixed asset ratio is 0.81, which is probably reasonable for his industry. The ratio does not indicate that Peter has heavy capital involvement. It also does not suggest that he lacks sufficient fixed assets to properly pack pickles.

DB 4.
$$\text{Times Interest Earned} = \frac{\text{Profit Before Tax} + \text{Interest Charges}}{\text{Interest Charges}}$$

The firm's ability to meet its interest payments is indicated by the times interest earned ratio. Interest is usually the major portion of the firm's contractually obligated payments. When the firm has difficulty meeting these payments, it is usually an indication of serious financial problems.

The times interest earned ratio for Peter's firm is 8.14, meaning that he could make his interest payments roughly eight times from his profit. This is very surprising for a firm as heavily encumbered with short-term debt as Peter's.

The mathematical reason for this is that the interest payments made by the firm this year are extremely small. The practical reason is probably that much of Peter's short-term debt is in the form of accounts payable and accrued taxes (i.e., money Peter owes the government but has not yet paid). Since neither form of debt requires interest payments, Peter has very low interest charges compared to his obligations.

Activity Ratios

Activity ratios measure the efficiency of the firm's operations by the intensity with which its assets are used to generate sales. The ratios should generally fall within some typical industry average range. Ratios which are consistently out of these ranges indicate that the firm is making inappropriate use of its assets and resources.

DB 1. $$\text{Inventory Turnover} = \frac{\text{Net Sales}}{\text{Inventory}}$$

As its name implies, the inventory turnover ratio gives the number of times during the year that the firm sells its complete inventory. A high ratio here is generally considered to be good; the firm is not spending money to finance slow-moving inventory, and the firm's customers are buying.

The ratio should not, however, be too high, as this would indicate that the firm inconveniences its customers with frequent delays and stock-outs. Similarly, the ratio should not be very low, as this would indicate that the inventory is obsolete or not being sold. Net sales, as used above, refers to the total dollar amount of sales for the period, less deductions for returns, allowances, and discounts.

Peter's Pickle Plant turns its inventory over 5.42 times per year. This is a healthy ratio for a firm which deals in a perishable product. If Peter turned over his inventory less frequently, it would probably mean that he had to sell stale pickles to his customers (in other words, his inventory would be sitting on the shelf longer). If Peter had a higher ratio, he would probably have times during the year that he could not meet the demand for pickles, and thus might lose customers.

DB 2. $$\text{Collection Period} = \frac{\text{Accounts Receivable} \times 365}{\text{Net Sales}}$$

The collection period is the number of days the firm takes (on average) to collect the money it makes on sales. The appropriate range for this ratio depends upon many factors, including the industry, general economic conditions, and management attitudes.

Long collection periods indicate that the firm is too lenient and many suffer larger losses from defaults and an increase in the cost of carrying credit. Short collection periods may show that the firm is losing customers due to excessively restrictive credit policies. This ratio can be particularly useful in evaluating the managerial policies of the firm.

Peter Piper's collection period is 61.5 days. Let's assume that Peter sells to his customers on terms of "Net 30" (which means that Peter wants to be paid in full within 30 days). A 61.5 day collection period may indicate that he is not very careful in following up his credit accounts. If times are difficult for pickle packers, Peter may have decided not to rush his customers in the hope that they will continue to buy from him rather than from a competitor. If this is not the case, Peter should take a careful look at his credit policy to get his collection period closer to 30 days.

DB 3. $$\text{Fixed Asset Turnover} = \frac{\text{Net Sales}}{\text{Fixed Assets}}$$

This ratio measures the intensity with which the firm uses its fixed assets. If the ratio is high, the firm's assets are productive. If the ratio is low, the assets are under-utilized. The ratio does not imply that the assets are profitable, merely whether or not they are used. It could be more profitable, for example, to replace the firm's asset base with more effective assets than to continue using the existing assets.

Peter's fixed asset turnover ratio is 8.77, which means that every dollar he has invested in his fixed assets has produced

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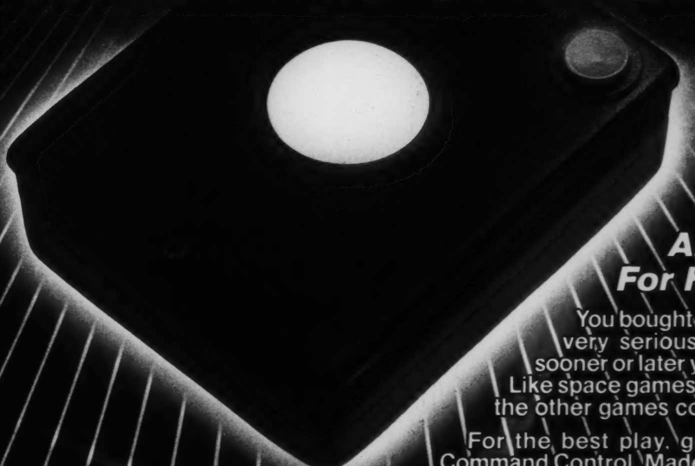

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Fin-Apple Ratios, continued...

$8.77 in sales. For a manufacturing firm which uses a lot of fixed assets this is excellent. This ratio is so high that Peter might consider the possibility of acquiring more assets and expanding his production capability.

DB 4.

$$\text{Working Capital Turnover} = \frac{\text{Net Sales}}{\text{Current Assets} - \text{Current Liabilities}}$$

The firm's use of its working capital (i.e., the difference between current assets and current liabilities) is measured by this ratio. Generally, a high value indicates efficient use of working capital. If the value is too high, however, it may indicate that the firm needs additional resources to operate effectively.

Peter turns over his working capital 3.33 times per year. This indicates effective use of current resources and shows that Peter does not, at this time, need further financing to operate well.

$$5.\ \text{Total Assets Turnover} = \frac{\text{Net Sales}}{\text{Total of all Assets}}$$

Total asset turnover is similar to fixed asset turnover. The only difference is that for this ratio, all assets are considered rather than just the fixed assets.

The total asset turnover for Peter's Plant is 1.91, which is, as expected, lower than his fixed asset turnover. This level of turnover indicates that for every dollar that Peter has invested in the pickle business, he generates $1.91 in sales. Peter should be very happy that his investments produce such a high level of sales.

$$6.\ \text{Number of Days of Payables} = \frac{\text{Accounts Payable} \times 365}{\text{Net Sales}}$$

The average amount of time the firm takes to pay its bills, is estimated by this ratio, which is also called the payables period. Healthy companies, under normal economic conditions, will generally try to pay their bills within 30 to 45 days. If the time before payment increases significantly, it may indicate that the firm has a critical shortage of cash. Many firms will manipulate the timing of their bill payments, however, to extend the amount of time their cash can collect interest.

Peter's payable period is 60.6 days, which means that if his suppliers sell on terms of Net 30, Peter does not pay promptly. Most firms expect that their clients will take a few extra days to pay their accounts and will tolerate late payments. Peter is in danger of harming his credit reputation, however, if he allows this excessively long payment period to continue.

Profitability Ratios

Profitability ratios are often the most important to any given firm. These ratios compare the amount of profit the firm generates to the factors which contribute to sales. Changes in these ratios may come from many sources but should be closely monitored by firms which are profit oriented. The ratios may give useful clues to the problems of the organization.

$$\text{DB 1. Return on Net Worth} = \frac{\text{Net Profit After Taxes}}{\text{Tangible Net Worth}}$$

This ratio measures the earnings on the owners' equity. The owners of a firm require a particular return on their investment. If the firm does not meet the expectations of the owners, they will withdraw their support. The firm wants this ratio to be high, indicating that the money provided by the owners of the firm is being used effectively to generate profits.

In Peter's case, return on net worth is 14.2%, meaning that for every dollar of net worth, the business returns $0.142 of profit. Depending upon outside economic conditions, this may or may not be acceptable to investors. In general, a high return indicates a healthy firm.

$$\text{DB 2. Sales Margin} = \frac{\text{Net Profit After Taxes}}{\text{Net Sales}}$$

The sales margin compares the amount of profit the firm makes to the amount of sales. Since this ratio can be interpreted as profit per dollar, the firm will want a high value. This does not mean that a firm with a low value is in trouble. There are many cases where firms make a very small amount of profit on a unit of sales, but the volume of sales is very high. Such firms will be profitable overall despite a low ratio.

The sales margin for Peter's plant is 2%, which indicates that for every dollar of pickles that Peter sells, $0.02 of profit is generated. Since Peter sells a high volume of pickles, the two cents per dollar adds up to an acceptable level of profit.

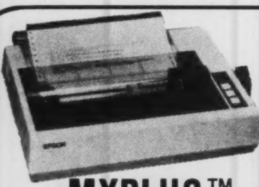
$$\text{DB 3. Productivity of Assets} = \frac{\text{Gross Income} - \text{Taxes}}{\text{Total Assets}}$$

The productivity of assets ratio shows how effectively the firm uses its assets to generate profits. The ratio will have a wide range, depending upon the industry in which the firm operates. It should, however, remain fairly constant for a given firm over time. Note that gross income is the actual dollar income of the firm before any deductions for interest, taxes, or dividends are made.

For Peter's firm, the productivity of assets ratio is 4.5%, indicating that the total assets of the company produce $0.45 of gross profit less an allowance for taxes.

$$4.\ \text{Gross Margin Ratio} = \frac{\text{Gross Margin}}{\text{Sales}}$$

A somewhat crude measure of profit per dollar is given by this ratio. The gross margin ratio compares the level of sales to



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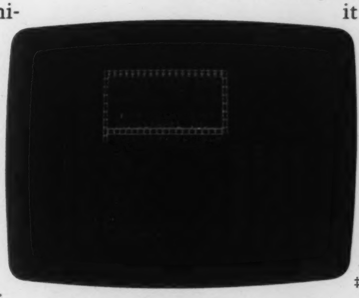

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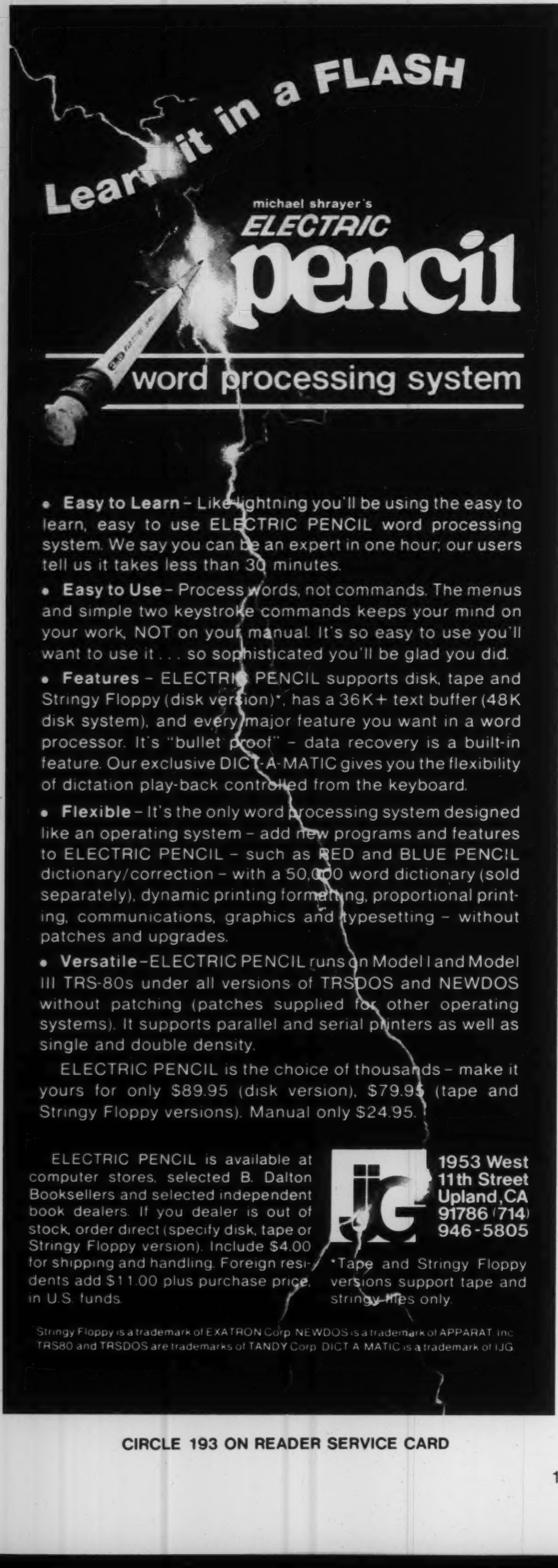

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Fin-Apple Ratios, continued...

the amount of profit the firm generates. The profit level involved does not take into account all expenses and taxes, thus the ratio is not wholly accurate. Gross margin (also called gross profit) is defined as net sales less cost-of-goods-sold.

The gross margin ratio for Peter's business is 41.5%. Comparing this to the sales margin (of 2%), which takes into account all expenses and taxes, we can see that these items take a big bite out of Peter's sales dollars. The interpretation of this information could be that for every dollar of sales, gross profit is $0.415, net profit is $0.02, and expenses and taxes are $0.385.

$$5.\ \text{Operating Margin Ratio} = \frac{\text{Operating Margin}}{\text{Sales}}$$

The operating margin ratio is useful for determining the sensitivity of income to small changes in sales. For example, a high ratio implies that a small change in sales, will result in a proportionally larger change in operating income. Operating margin is defined as gross margin less operating expenses.

Peter's operating margin ratio is 4.5%. This is due to the type of business that Peter is in—one of high volume and low profit per unit sold. A company which sells high priced items, such as a jewelry store or automobile dealer, will have a much higher operating margin due to its low turnover rate and high overhead.

Coverage Ratios

Coverage ratios indicate the firm's ability to pay its debts. These ratios compare the amount of money available to the firm to the amount of interest, lease payments, and debt reductions for which the firm is obligated. High ratios indicate that the firm can meet its obligations from its income.

Low ratios might indicate that the firm will have to seek help from outside sources to meet its obligations. Low ratios combined with unfavorable economic conditions may force the firm into bankruptcy. Thus, these ratios are carefully examined by creditors.

$$1.\ \text{Fixed Charge Coverage} = \frac{\text{Gross Income}}{\text{Interest} + \text{Lease Payments} + \dfrac{\text{Sinking Fund Payments}}{1 - \text{Tax Rate}}}$$

This ratio compares the amount of money the firm brings in, to the contractual obligations the firm must meet. If the ratio is high, the firm will probably be able to meet its obligations without financially embarrassing maneuvers.

Note that sinking fund payments are simply deposits into a special account that will be used to pay off the debt when it matures. Many lenders require sinking funds when they make very large loans. The interest term in the equation is the total amount of interest paid out on all debts during this period.

Peter's fixed charge coverage ratio is 9.57, which means that for every dollar he is obligated to pay to creditors, he has $9.57 available in income. In other words, Peter can cover his obligations about nine and a half times. This would be considered high for most firms, since they usually have higher debt levels than Peter does.

$$2.\ \text{Debt Service Coverage} = \frac{\text{Profit Before Taxes} + \text{Interest} + \text{Lease Payments}}{\text{Interest} + \text{Lease Payments} + \dfrac{\text{Sinking Fund Payments}}{1 - \text{Tax Rate}}}$$

The debt service coverage ratio, like the previous ratio, indicates the firm's ability to meet its contractual obligations.

Peter's debt service coverage ratio is the same as his fixed charge coverage ratio, 9.57. This is because Peter's debt is structured very simply, and the differences in the equations for fixed charge coverage and debt service coverage do not come into play.

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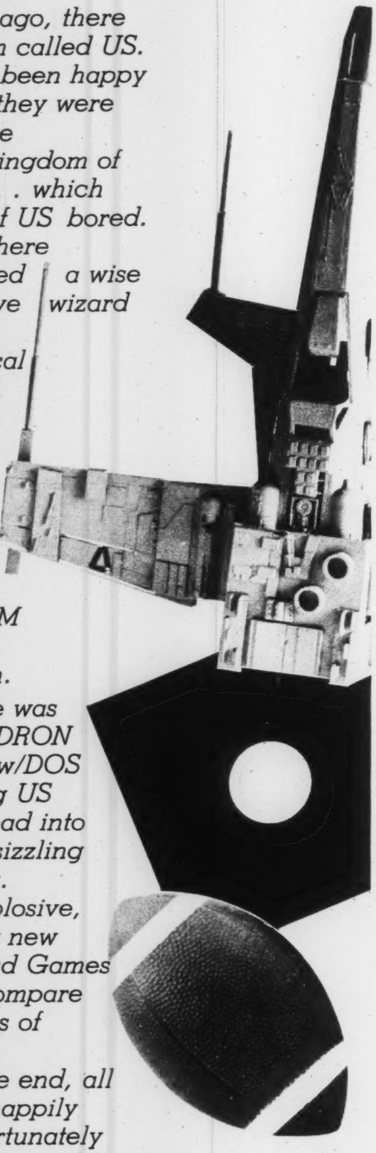

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Fin-Apple Ratios, continued...

Stock Ratios

Stock ratios are used to evaluate how well the firm's own stock is performing in the market. These ratios are particularly useful when comparing two or more firms. Generally, the firm with the highest ratios is more profitable and/or is perceived by investors to be more promising.

1. $$\text{Earnings per Share} = \frac{\text{Total Net Earnings}}{\text{Number of Common Shares}}$$

This ratio shows the amount of profit generated by each share of common stock. High ratios indicate profitable firms which are more attractive to investors. This means that the earnings per share ratio has a direct effect on the price of the stock.

Peter's firm has an earnings per share (EPS) of \$0.875/share. This means that every share of stock in Peter's plant generates about \$0.88 in earnings. To evaluate how good or bad this number is, the stock price must also be taken into consideration.

2. $$\text{Price to Earnings} = \frac{\text{Market Price per Share}}{\text{Earnings per Share}}$$

The price/earnings ratio indicates how the market perceives the value of the stock. A high ratio shows that investors believe the firm's prospects, profits, and management are good. High ratios are also typical of "glamour" industries.

Low ratios are not necessarily bad, as they may indicate a conservative firm in a stable industry. If the trend in this ratio is downward over time, however, investors probably see the firm as declining.

The price/earnings (P/E) ratio for Peter's firm is 13.7. This value seems reasonable for Peter, and is neither ridiculously high or low. Earnings of \$0.875 per share would be phenomenally low for a stock with a price of \$100 per share, and leads to an unreasonably high P/E ratio. The P/E ratio gives a measure of the appropriateness of a firm's earnings compared to the investments made in the firm.

3. CAPM (a Stock's Required Rate of Return) =
$$Ks = Kf + Beta \times (Kf - Km)$$

The capital asset pricing model (CAPM), is a technique used to estimate an investor's required rate of return on a given stock. The equation takes into account current market conditions and the inherent risk in the individual stock. The terms of the equation are defined as follows:

Kf is the "risk-free" rate of return in the current market. This is usually the current T-bill rate (i.e., the interest the government pays on its own debt).

Km is the current average market rate of return. This figure fluctuates with market conditions and buyer demand. This figure can usually be approximated by the current yield on average quality corporate bonds.

Beta is a measure of the volatility (in price) of an individual stock. Basically, a high Beta indicates a firm with a high degree of price swing versus the market as a whole. Such a firm will have to pay a high rate of return to its stockholders to compensate them for taking the risk of a large price drop.

A low Beta usually indicates a firm which experiences smaller price swings than the market average. A Beta value equal to one indicates a firm which follows market price variations very closely. Several large investment firms calculate and publish the Beta values for publicly traded firms.

Ks is the investor's required rate of return on the stock involved.

The CAPM for Peter's firm yields a value of 15.5% based on Peter's Beta of 1.25, the expected market return of 15%, and the T-bill rate of 13%. What this means is that Peter's stock price is expected to fluctuate over a wider range than an "aver-

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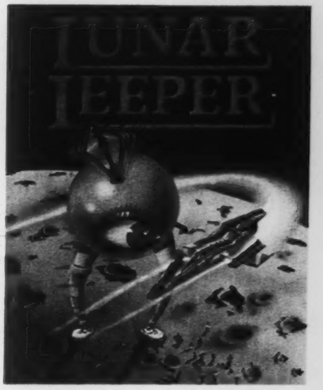

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to rescue some men
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age" stock (one that responds in exactly the same way that the market as a whole does).

Those people who invest in Peter's firm will expect a higher rate of return on their investment, than they would from a stock which tracks the market exactly. The reason for this, is that if the overall market goes down, the price of Peter's stock is expected to drop by more than the market does. Thus, investors require a higher rate of return from Peter's stock, to compensate them for taking the greater risk.

4. Stock's Projected Market Price =

$$\frac{\text{Current Dividend x (1 + Growth Rate)}}{\text{Market Rate of Return – Growth Rate}}$$

The stock's projected market price is an equation which estimates the long-term average price for a given firm's stock. Price is partially determined by a firm's own growth and by the dividends it pays to its shareholders. The effect of outside economic factors on the stock price is considered by the "market rate of return" term which consolidates the effects of interest rates, investor preferences, legislation, and other outside forces.

The "growth rate" term refers to the compound rate of the firm's growth over a long period of time. For any single stock in the market place, the price may range to points widely different from the result of this equation. Such variations usually balance out to the projected stock price over the long term, however.

The calculated stock price for Peter's firm is $10.70 per share, which is below Peter's current selling price of $12 per share. Since the price per share is reasonably close to the selling price, an investor may feel confident that he has paid a reasonable price for the stock.

If the calculated price varies widely from the market price, it sometimes indicates that the market expects a major change in the growth and profitability of the company. In other cases, the calculated stock price equation should not be applied.

For example, a firm experiencing "super-normal" growth will be unable to maintain its growth rate for more than a few years. This high growth rate will push the results of the equation well beyond any reasonable limits.

Finally, the actual price may vary from the calculated price due to forces which the equation cannot take into account.

Figure 3.

Peter Piper's Pickle Packing Plant

Year	Sales	Inventory	Inventory to Sales
Previous	$3300K	$580K	.176 or 17.6%
Current	$3500K	$645K	.184 or 18.4%

Summary

Taken together, the six types of financial ratios can provide a snapshot of the firm's position, prospects, and problems. If the complete set of ratios is calculated for several consecutive time periods, trends in the firm can often be seen. As an example, inventory accounts which are not closely controlled may grow faster than the rate of sales. This creates an extra financial burden on the firm.

Figure 3 shows the performance of Peter's firm over two consecutive years. Note that Peter's sales and inventory have both increased, but the balance between them has become less favorable. Peter is holding a larger amount of inventory than is optimum for this level of sales. He should note the increased use of inventory and seek its cause. By performing this simple ratio test, problems which are not evident from the raw sales and inventory data can be spotted and corrected. Similar possibilities exist for the use of other financial ratios.

The Fin-Apple Ratios Program

The ratio program is menu-driven to be as simple as possible for the user. Each entry of the main menu corresponds to one of four principle functions:

1. Initial data entry and data modification (options 1, 2, 3).
2. Storage and retrieval of data to a 5¼" floppy disk (option 10).
3. Actual calculation of the ratios, and optionally, their output to a printer (options 4, 5, 6, 7, 8).
4. Exiting the program when finished (option 11).

The data entry functions bring the user to computer-driven questionnaires which guide the entry of data from balance sheets, income statements, and stock information. The ratio calculation functions automatically display the ratios of the selected set together with the values of those ratios.

The file function allows the user to create and store files of data on those firms which are useful for more than one analysis. The exit function brings the user back to DOS.

Each sub-function of the main menu allows the user a choice of options. For data entry functions, the user may change previously entered data, have the data printed out, or return to the main menu. For the ratio calculation functions, the user may either have the ratio set printed out or returned to the main menu. In all cases, the program is designed to return to the main menu if an error is detected.

The first time the program is used, it will be necessary to enter all the data to be operated upon. In subsequent runs, the data can be stored to the disk in the files. (Note that the stock data is necessary only if the user wishes to calculate stock-related ratios.)

When entering dollar amounts, the program expects the numbers to be in thousands. Therefore, an amount such as

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Fin-Apple Ratios, continued...

$1,358,000. should be entered as 1358. When non-dollar amounts, such as the number of shares of common stock outstanding are being entered, they should be entered fully. For example, 1,500,000 shares of stock would be entered as 1500000.

If an error is made during data entry, a single entry may be changed without re-entering the entire set. This is done by entering a –1 for each entry which is to remain the same, and correcting those entries which were in error. Note: this feature makes –1 an invalid data value for input into the program. If the value –1 is needed as a data point, use the value of –.999 to overide this feature.

Finally, to assist the user in locating a persistent error, line 80 of the program can be replaced with a REMark. This will eliminate the error trapping feature of the program.

Some printers, such as the Centronics 773, will not recognize the TAB feature which is used for spacing the output of the program. Printers like the Epson MX-80, however, will give an output that mirrors the CRT screen. If you find a spacing problem with your printer, consult your manual to see if your printer requires special initialization codes to enable the TAB feature.

The following list gives the general procedure for running the program:

1. Load the program into an Apple II computer, running Applesoft, and type RUN.
2. The main menu should be automatically displayed on the screen.
3. If this is the first time the program has been run, enter the appropriate data by calling the data-entry functions from the main menu. Note that any dollar amounts should be entered in thousands. To check out the newly entered program, it is suggested that the figures for Peter's company be loaded. Then compare the resulting ratios to those given in this article.

If there is a file in memory which is to be used for operating data, call the appropriate file from the main menu.

4. To calculate the desired ratios, call the appropriate routine by selecting its number from the main menu. The program will automatically calculate and display the ratio set.
5. If there are any problems in running the program, each sub-function of the main menu offers a choice, to print or return, when the specific function has been completed.
6. To exit the program, enter 11 when the main menu is displayed.

For Further Information

It should be obvious that this article is an attempt only to acquaint the novice with financial ratio analysis. Those who would like to learn more about the subject may find the following texts of interest:

The Guide to Case Analysis and Reporting, Edge and Coleman, Systems Logistics Honolulu, HI, 1978. This is an excellent beginner's text, that is written and presented in a manner that is very understandable to the novice.

Financial Management Theory and Practice, Brigham Dryden Press, Hinsdale, IL, 1979. This is a well respected college text used in intermediate level finance classes.

Techniques of Financial Management, Helfert, Irwin Press, Homewood, IL, 1977. This text deals with the various financial analysis tools in use today. It is a more advanced text which presupposes prior knowledge of the field.

Dun's Review, A Dun and Bradstreet Publication, 666 Fifth Ave., New York, NY. A well known source of compiled financial data for industries and individual companies. □

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CIRCLE 148 ON READER SERVICE CARD *ALL BRANDS ARE REGISTERED TRADEMARKS*

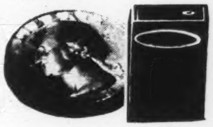
```
10  REM  FINANCIAL RATIO ANALYSIS PROGRAM
20  REM  WRITTEN BY WILLIAM PURPURA
30  REM   COPYRIGHT JULY 05,1982
40  REM  ALL RIGHTS RESERVED BOTH
50  REM  NATIONAL AND INTERNATIONAL
60  REM  PROGRAM WRITTEN IN APPLESOFT
70  REM  BASIC FOR THE APPLE II COMPUTER
75  REM  PROGRAM NEEDS A DISK DRIVE, BUT
77  REM  A PRINTER IS NOT NEEDED.
80  ONERR  GOTO 980
90  DIM LR$(4),LM$(4),OP$(11),RR$(4),RM$(6),AM$(3),PR$(5),PM$(5),CR$(2),CM$(5),S
R$(10),BS$(16),IS$(22)
100 OT = 1:PR = 0
110 D$ = "": REM  CNTL D
120  GOTO 980
130  HOME
140  INPUT "READ IN A FILE(YES=1,NO=2)";Q: IF Q = 2 THEN 560
150  IF Q < 1 OR Q > 2 THEN 130
160  INPUT "ENTER THE FILE NAME ";NC$
170  PRINT D$;"OPEN";NC$
180  PRINT D$;"READ";NC$
190  INPUT K1
200  INPUT K2
210  INPUT K3
220  INPUT K4
230  INPUT K5
240  INPUT K6
250  INPUT K7
260  INPUT K8
270  INPUT K9
280  INPUT KA
290  INPUT KB
300  INPUT KC
310  INPUT KD
320  INPUT KE
330  INPUT J1
340  INPUT J2
350  INPUT J3
360  INPUT J4
370  INPUT J5
380  INPUT J6
390  INPUT J7
400  INPUT J8
410  INPUT J9
420  INPUT JA
430  INPUT JB
440  INPUT JC
450  INPUT JD
460  INPUT JE
470  INPUT JF
480  INPUT S3
490  INPUT S4
500  INPUT S5
510  INPUT S6
520  INPUT S7
530  INPUT S8
540  INPUT SB
550  PRINT D$;"CLOSE";NC$
560  INPUT "WRITE OUT FILE(YES=1,NO=2)";Q: IF Q = 2 THEN 980
570  IF Q < 1 OR Q > 2 THEN 560
580  INPUT "ENTER THE FILE NAME ";NC$
590  PRINT D$:"OPEN":NC$
600  PRINT D$;"WRITE";NC$
610  PRINT K1
620  PRINT K2
630  PRINT K3
640  PRINT K4
650  PRINT K5
660  PRINT K6
670  PRINT K7
680  PRINT K8
690  PRINT K9
700  PRINT KA
710  PRINT KB
720  PRINT KC
730  PRINT KD
740  PRINT KE
750  PRINT J1
760  PRINT J2
770  PRINT J3
780  PRINT J4
790  PRINT J5
800  PRINT J6
810  PRINT J7
820  PRINT J8
830  PRINT J9
840  PRINT JA
850  PRINT JB
860  PRINT JC
870  PRINT JD
880  PRINT JE
890  PRINT JF
900  PRINT S3
910  PRINT S4
920  PRINT S5
930  PRINT S6
940  PRINT S7
950  PRINT S8
960  PRINT SB
970  PRINT D$;"CLOSE";NC$
980  HOME : REM  S=4 LEVERAGE RATIO
990 OP$(1) = "INPUT BALANCE SHEET": REM  S=1
1000 OP$(2) = "INPUT INCOME STATEMENT DATA": REM  S=2
1010 OP$(3) = "INPUT THE STOCK PRICE DATA": REM  S=3
1020 OP$(4) = "LIQUIDITY RATIOS": REM  S=4
1030 OP$(5) = "LEVERAGE RATIOS": REM  S=5
1040 OP$(6) = "ACTIVITY RATIOS": REM  S=6
1050 OP$(7) = "PROFITABILITY RATIOS": REM  S=7
1060 OP$(8) = "COVERAGE RATIOS": REM  S=8
1070 OP$(9) = "STOCK RATIOS": REM  S=9
1080 OP$(10) = "FILE INPUT/OUTPUT": REM  S=10
1090 OP$(11) = "EXIT PROGRAM": REM  S=10
1100 DB$ = "(D&B KEY RATIO)"
1110 LR$(1) = "CURRENT RATIO": REM  W1
1120 MI$ = "*** MISC. INFORMATION ***"
1130 LR$(2) = "INVENTORY TO WORKING CAPITAL": REM  W2
1140 LR$(3) = "CURRENT DEBT TO INVENTORY": REM  W3
1150 LR$(4) = "QUICK RATIO": REM  W4
1160 LM$(1) = "TOTAL WORKING CAPITAL": REM  C1
1170 LM$(2) = "TOTAL CURRENT DEBT": REM  K9
1180 LM$(3) = "TOTAL CURRENT ASSETS": REM   K4
1190 LM$(4) = "ENDING INVENTORY": REM  K3
1200 AR$(1) = "INVENTORY TURNOVER": REM  A1
1210 AR$(2) = "COLLECTION PERIOD": REM  A2
1220 AR$(3) = "FIXED ASSET TURNOVER": REM  A3
1230 AR$(4) = "WORKING CAPITAL TURNOVER": REM  A4
1240 AR$(5) = "TOTAL ASSET TURNOVER": REM  A5
1250 AR$(6) = "NUMBER OF DAYS OF PAYABLES": REM  A6
```

It's like having X-ray ears...

Tiny, powerful electronic "ears" let you hear whispers through walls, conversations 2 miles away.

The **Dyna-Mike Transmitter**

It's smaller than a quarter. But DYNA-MIKE will transmit every sound in a room to an FM radio tuned to the proper unused frequency, from ⅓ mile to 2 miles away.



If you're at a neighbor's home a block from your own, you can hear your baby's cry, or you can tell the instant your spouse comes home. If two of you are driving tandem in two cars, one or both of you can communicate with the other even if other cars drive between you.

DYNA-MIKE has as many uses as your imagination can think of. For a business conference, let the tiny microphone sit unobtrusively on the table or concealed on a shelf, and you'll be able to record every word. For businesses, you can put an FM receiver in a warehouse or remote office and "broadcast" instructions or orders to be filled.

Public speakers never had a better friend than the DYNA-MIKE. No wires or setup — just turn on one or more radios and your speech will come through with perfect fidelity. Put one on the front porch. If you hear a suspicious sound, turn on the radio and you'll hear the doorbell or the ring of the telephone.

Choose Your Model

New Horizons is introducing three models of the DYNA-MIKE supersensitive broadcast microphone. Model IC-18 is the world's smallest micorphone — it's a miracle of electronic miniature power, with a high-fidelity range of 1800 feet. Introductory price is $129.95 (two for only $119.95 each).

Model X-18 is the longest-range microphone, with an unbelievable two-mile range. Introductory price is $149.95 (two for only $139.95 each).

Model X-3 is the most sensitive microphone. It broadcasts perfect-quality sound even from low-levels or whispers, up to 1,500 feet. Introductory price is $99.95 (two for only $89.95 each).

Each microphone is fully wired, complete with standard HC-1.35v. battery, good for 100 hours of continuous use and easily and inexpensively replaceable.

Of course you're protected by the New Horizon guarantee: use any DYNA-MIKE transmitter microphone for 30 days, with the right to return it for a full refund if you're not delighted.

The **Super-Ear**

You'll hear it all.

Effortlessly, you can hear not just a baby's cries, but quiet breathing, through a concrete wall a foot thick. Put the SUPER-EAR earphone in your ear and place the speaker on the wall. That's all there is to it.

SUPER-EAR hears everything, and even more astounding, hears it clearly. It's as though the wall weren't there. If you're coming home late at night and think intruders are in your residence, let SUPER-EAR find out for you. Want to know if the meeting is over in the room with the closed door? SUPER-EAR will tell you in a second.

SUPER-EAR is undetectable from the other side of the wall. The quality of sound has amazing fidelity—good enough to record, and SUPER-EAR has its own built-in recorder jack.

Because SUPER-EAR is the ultimate listening device, you can use it to pinpoint hidden squeaks in your car or the source of mysterious engine noises. Construction experts use it to check for flaws or cracks in buildings. **It Works Anywhere!**

Ever put your ear to a railroad track to try to hear the train? Try it with SUPER-EAR. You'll hear that train many miles away. Use it as a powerful stethoscope on yourself, a friend, or a pet. You can even hear a bird's breathing.

The only source for SUPER-EAR is New Horizons. Choose from two models — Model SB-5, with ultrasensitive microphone, $139.95 (two for only $129.95 each); or Model SB-1, with suction-type microphone, $99.95 (two for only $89.95 each).

Use your SUPER-EAR for 30 days. If for any reason you're not delighted, the absolute New Horizons guarantee means you can return it for a prompt refund.

The **Phone Answerer Recorder**

The PHONE ANSWERER/RECORDER connects in seconds between any tape recorder and your telephone. When you're away it automatically delivers a message up to 20 seconds to anyone who calls: when you'll return, when to call back, where you are.

PHONE
ANSWER
CONTROL

When you're there, the ANSWERER/-RECORDER starts any cassette recorder automatically when you pick up the phone and shuts off when you hang up.

It records both sides of the conversation with astonishing clarity, giving you a permanent record of every call, preventing unauthorized use of your phone, and eliminating misunderstandings over what was said. It's specially wired to extend recording time on your tape recorder. Needs no batteries - it's always "alive".

The PHONE ANSWERER/RECORDER is a masterpiece of miniaturization. It's yours for $49.95 (two for only $44.95 each). PHONE RECORDER unit alone, records but doesn't answer, $29.95 (two for $24.95) each). Every instrument has the unbeatable New Horizons guarantee.

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CIRCLE 233 ON READER SERVICE CARD

```
1260 AM$(1) = "NET SALES FOR PERIOD": REM  J1
1270 AM$(2) = "RECIEVABLES FOR PERIOD": REM  K2
1280 AM$(3) = "PAYABLES FOR PERIOD": REM  K8
1290 PR$(1) = "RETURN ON NET WORTH": REM  P1
1300 PR$(2) = "SALES MARGIN": REM  P2
1310 PR$(3) = "TOTAL ASSET PRODUCTIVITY": REM  P3
1320 PR$(4) = "GROSS PROFIT TO SALES": REM  P4
1330 PR$(5) = "OPERATING PROFIT TO SALES": REM  P5
1340 PM$(1) = "NET AFTER TAX PROFIT": REM  YY=JA-JB
1350 PM$(2) = "TANGIBLE NET WORTH": REM  XX=KD-K6
1360 PM$(3) = "NET SALES FOR PERIOD": REM  J1
1370 PM$(4) = "EARNINGS BEFORE INT. & TAX": REM  J8
1380 PM$(5) = "GROSS PROFIT FOR PERIOD": REM  J3
1390 CR$(1) = "FIXED CHARGES COVERAGE": REM  C1
1400 CR$(2) = "DEBT SERVICE COVERAGE": REM  C2
1410 CM$(1) = "PROFIT BEFORE TAXES": REM  JA
1420 CM$(2) = "TOTAL INTEREST CHARGES": REM  J9
1430 CM$(3) = "TOTAL LEASE OPBLIGATIONS": REM  JE
1440 CM$(4) = "SINKING FUND PAYMENTS": REM  JF
1450 CM$(5) = "TOTAL DEPRECIATION": REM  J5
1460 SR$(1) = "EARNINGS PER SHARE - EPS": REM  S1
1470 SR$(2) = "PRICE TO EARNINGS - P/E": REM  S2
1480 SR$(3) = "STOCK'S CURRENT PRICE": REM  S3
1490 SR$(4) = "CURRENT DIVIDEND PAYOUT": REM  S4
1500 SR$(5) = "MARKET INTEREST RATE (%)": REM  S5
1510 SR$(6) = "'T' BILL INTEREST RATE (%)": REM  S6
1520 SR$(7) = "STOCKS CURRENT BETA": REM  S7
1530 SR$(8) = "STOCKS GROWTH RATE": REM  S8
1540 SR$(9) = "CAPM STOCK RETURN": REM  S9
1550 SR$(10) = "CALCULATED STOCK PRICE": REM  SA
1560 RR$(1) = "TOTAL DEBT TO NET WORTH": REM  L1
1570 RR$(2) = "CURRENT DEBT TO NET WORTH": REM  L2
1580 RR$(3) = "FIXED ASSETS TO NET WORTH": REM  L3
1590 RR$(4) = "TIMES INTEREST EARNED": REM  L4
1600 RM$(1) = "TANGIBLE NET WORTH": REM  T1
1610 RM$(2) = "CURRENT DEBT": REM  K9
1620 RM$(3) = "LONG TERM DEBT": REM  KA
1630 RM$(4) = "TOTAL FIXED ASSETS": REM  K5
1640 RM$(5) = "PROFIT BEFORE TAXES": REM  J6
1650 RM$(6) = "INTEREST PAID THIS PERIOD": REM  J9
1660 BS$(1) = "CASH AND ITS EQUIVELENT= ": REM  K1
1670 BS$(4) = "TOTAL CURRENT ASSETS= ": REM  K4
1680 BS$(3) = "NET INVENTORY (LESS CORR.)= ": REM  K3
1690 BS$(5) = "TOTAL FIXED ASSETS (LESS DEPR.)= ": REM  K5
1700 BS$(7) = "TOTAL OF ALL ASSETS= ": REM  K7
1710 BS$(2) = "NET ACCOUNTS RECIEVABLE= ": REM  K2
1720 BS$(6) = "INTANGIBLE ASSETS= ": REM  K6
1730 BS$(8) = "TOTAL ACCOUNTS PAYABLE= ": REM  K8
1740 BS$(9) = "TOTAL CURRENT LIABILITIES= ": REM  K9
1750 BS$(10) = "TOTAL LONG TERM DEBT= ": REM  KA
1760 BS$(14) = "RETAINED EARNINGS= ": REM  KE
1770 BS$(13) = "TOTAL COMMON STOCK= ": REM  KD
1780 BS$(11) = "TOTAL OF ALL LIABILITIES= ": REM  KB
1790 BS$(12) = "TOTAL OF PREFERED STOCK= ": REM  KC
1800 BS$(15) = "TOTAL STOCK HOLDERS EQUITY= ": REM  KD
1810 BS$(16) = "TOTAL EQUITY AND LIABILITIES= ": REM  KE
1820 IS$(1) = "NET SALES THIS PERIOD= ": REM  J1
1830 IS$(2) = "COST OF GOODS SOLD= ": REM  J2
1840 IS$(3) = "GROSS PROFIT= ": REM  J3
1850 IS$(4) = "GROSS OPERATING PROFIT= ": REM J4
1860 IS$(5) = "TOTAL DEPRECIATION THIS PERIOD= ": REM  J5
1870 IS$(6) = "NET PROFIT FROM OPERATIONS= ": REM  J6
1880 IS$(7) = "OTHER INCOME= ": REM  J7
1890 IS$(8) = "GROSS INCOME= ": REM  J8
1900 IS$(9) = "INTEREST PAID THIS PERIOD= ": REM  J9
1910 IS$(10) = "NET BEFORE TAX INCOME= ": REM  JA
1920 IS$(11) = "TOTAL TAXES PAID= ": REM  JB
1930 IS$(12) = "DIVIDENDS FOR THIS PERIOD= ": REM  JC
1940 IS$(13) = "ENDING RETAINED EARNINGS= ": REM  JD
1950 IS$(14) = "TOTAL OF LEASE PAYMENTS= ": REM  JE
1960 IS$(15) = "TOTAL SINKING FUND PAYMENTS= ": REM  JF
1970 IS$(16) = "STOCKS CURRENT PRICE= ": REM  S3
1980 IS$(17) = "STOCKS CURRENT DIVIDEND= ": REM  S4
1990 IS$(18) = "MARKET INTEREST RATE (%)= ": REM  S5
2000 IS$(19) = "CURRENT T BILL RATE (%)= ": REM  S6
2010 IS$(20) = "STOCKS CURRENT BETA= ": REM  S7
2020 IS$(21) = "STOCKS GROWTH RATE (%)= ": REM  S8
2030 IS$(22) = "# OF SHARES OF COMMON (K)": REM  SB
2040  HOME : TEXT
2050  IF OT = 2 THEN 5050: GOTO 2060
2060  GOSUB 4990: GOSUB 5010: GOSUB 5030: ON S GOSUB 2070,2470,2890,3160,3450,37
60,4080,4420,4650,130,4940: GOTO 2050
2070  REM  INPUT THE BALANCE SHEET
2080  HOME : PRINT "  INPUT THE BALANCE SHEET DATA"
2090  VTAB 3: PRINT BS$(1);K1: INPUT L: IF L <  >  - 1 THEN K1 = L
2100  VTAB 4: PRINT BS$(2);K2: INPUT L: IF L <  >  - 1 THEN K2 = L
2110  VTAB 5: PRINT BS$(3);K3: INPUT L: IF L <  >  - 1 THEN K3 = L
2120  VTAB 6: PRINT BS$(4);K4: INPUT L: IF L <  >  - 1 THEN K4 = L
2130  VTAB 7: PRINT BS$(5);K5: INPUT L: IF L <  >  - 1 THEN K5 = L
2140  VTAB 8: PRINT BS$(6);K6: INPUT L: IF L <  >  - 1 THEN K6 = L
2150  VTAB 9: PRINT BS$(7);K7: INPUT L: IF L <  >  - 1 THEN K7 = L
2160  VTAB 10: PRINT BS$(8);K8: INPUT L: IF L <  >  - 1 THEN K8 = L
2170  VTAB 11: PRINT BS$(9);K9: INPUT L: IF L <  >  - 1 THEN K9 = L
2180  VTAB 12: PRINT BS$(10);KA: INPUT L: IF L <  >  - 1 THEN KA = L
2190  VTAB 13: PRINT BS$(11);KB: INPUT L: IF L <  >  - 1 THEN KB = L
2200  VTAB 14: PRINT BS$(12);KC: INPUT L: IF L <  >  - 1 THEN KC = L
2210  VTAB 15: PRINT BS$(13);KD: INPUT L: IF L <  >  - 1 THEN KD = L
2220  VTAB 16: PRINT BS$(14);KE: INPUT L: IF L <  >  - 1 THEN KE = L
2230  HOME
2240 HO = 1
2250  IF HO = 2 THEN  PRINT D$;"PR#1"
2260  PRINT "     BALANCE SHEET DATA"
2270  VTAB 3: PRINT BS$(1);K1
2280  VTAB 4: PRINT BS$(2);K2
2290  VTAB 5: PRINT BS$(3);K3
2300  VTAB 6: PRINT BS$(4);K4
2310  VTAB 7: PRINT BS$(5);K5
2320  VTAB 8: PRINT BS$(6);K6
2330  VTAB 9: PRINT BS$(7);K7
2340  VTAB 10: PRINT BS$(8);K8
2350  VTAB 11: PRINT BS$(9);K9
2360  VTAB 12: PRINT BS$(10);KA
2370  VTAB 13: PRINT BS$(11);KB
2380  VTAB 14: PRINT BS$(12);KC
2390  VTAB 15: PRINT BS$(13);KD
2400  VTAB 16: PRINT BS$(14);KE
2410  PRINT D$;"PR#0"
2420  VTAB 23: INPUT "MODIFY=1, PRINTER=2, MENU=3 ";T: IF T = 1 THEN 2080
2430  IF T = 2 THEN HO = 2
2440  IF T = 2 THEN 2250
2450  IF T = 3 THEN  RETURN
2460  IF T > 3 OR T < 1 THEN 2420
2470  REM  S=2 INCOME STATEMENT
2480  HOME : PRINT "   INPUT THE INCOME STATEMENT"
2490  VTAB 3: PRINT IS$(1);J1: INPUT L: IF L <  >  - 1 THEN J1 = L
2500  VTAB 4: PRINT IS$(2);J2: INPUT L: IF L <  >  - 1 THEN J2 = L
2510  VTAB 5: PRINT IS$(3);J3: INPUT L: IF L <  >  - 1 THEN J3 = L
2520  VTAB 6: PRINT IS$(4);J4: INPUT L: IF L <  >  - 1 THEN J4 = L
2530  VTAB 7: PRINT IS$(5);J5: INPUT L: IF L <  >  - 1 THEN J5 = L
2540  VTAB 8: PRINT IS$(6);J6: INPUT L: IF L <  >  - 1 THEN J6 = L
2550  VTAB 9: PRINT IS$(7);J7: INPUT L: IF L <  >  - 1 THEN J7 = L
2560  VTAB 10: PRINT IS$(8);J8: INPUT L: IF L <  >  - 1 THEN J8 = L
```

NEW Unlocked Apple® Utility Disks

Don't Blow Your Bucks on Locked-Up Uncopyable Apple Software.

NEW!

Frame-Up

HI-SPEED GRAPHICS DISPLAY
BY TOM WEISHAAR

CREATE PROFESSIONAL PRESENTATIONS of intermixed hi-res, lo-res and text frames. Easy-to-use and FAST— hi-res images load in 2½-seconds! Paddles or Keyboard-advance frames in forward or reverse.

UNATTENDED SHOWS are possible with each frame individually pre-programmed to appear on the screen from 1 to 99 seconds.

TEXT SCREEN EDITOR lets you create your own b/w text "slides". Add type "live" from the keyboard during presentations if you want.

DISPLAY MODULE: Send entire presentations-on-disk to your friends and associates.

FRAME-UP: $29.50
(includes Peeks/Pokes Chart)

Apple Mechanic

SHAPE-WRITER/BYTE-ZAP DISK
BY BERT KERSEY

SHAPE EDITOR: Keyboard-draw shapes for hi-res animation in your programs. Design proportionally-spaced typefaces with special characters. 6 fonts on the disk. Listable demos show how to use shape tables to animate games, graphics and professional Charts & Graphs.

BYTE-ZAP: Rewrite any byte on a disk for repair or alteration. Load entire sectors on the screen for inspection. Hex/Dec/Ascii displays and input. Complete instructions for making trick file names, restoring deleted files, etc.

MORE: Useful music, text and hi-res tricks for your programs. Educational documentation.

APPLE MECHANIC: $29.50
(includes Peeks/Pokes Chart & Tip Book*5)

NEW!

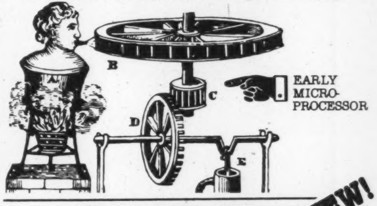
Typefaces

FOR APPLE MECHANIC

26 NEW FONTS for Apple Mechanic's Xtyper and Hi-Writer programs. Most are full 96-character fonts, large & small, of fully-editable characters. (Apple Mechanic required)

BEAGLE MENU: Use with your disks. Display only the filenames you want (e.g. only Applesoft files or only Locked files) for one-key cursor selection/execution. Space-on-disk, catalog scan, optional sector-number elimination.

TYPEFACES: $20.00
(includes Peeks/Pokes Chart & Beagle Menu Utility)



Beagle Bag

NEW!

12-GAMES-PLUS ON ONE DISK
BY BERT KERSEY

TWELVE GREAT GAMES from the classic Beagle Bros collection— TextTrain, Slippery Digits, Wowzo, Magic Pack, Buzzword... Almost all of our "Game Pack" games, updated and re-released on one jam-packed, entertaining, unprotected disk.

COMPARE BEAGLE BAG with any one-game locked-up game disk on the market today. All 12 games are a blast, the price is right, the instructions are crystal clear, AND the disk is copyable. You can even change the programs or list them to LEARN, and see what makes them tick.

BEAGLE MENU TOO: See "Typefaces" above.

BEAGLE BAG: $29.50
(includes Peeks/Pokes Chart & Beagle Menu Utility)

NEW!

Flex Text

70-COLUMN TEXT UTILITY
BY MARK SIMONSEN

PRINT VARIABLE-WIDTH TEXT on the hi-res screens with normal Applesoft commands (including Htab 1-70). Normal, expanded & compressed text on same screen— no hardware!

ADD GRAPHICS TO TEXT or vice-versa. Run existing programs under Flex Text control. Easy to use and compatible with PLE© and GPLE.©

DOS TOOL KIT© FONT compatibility, or use Flex Text fonts. Select up to 9 fonts with ctrl-key commands. Print/List/Catalog in any style! Custom TEXT CHARACTER EDITOR included.

FLEX TEXT: $29.50
(includes Peeks/Pokes Chart; requires monitor)

Utility City

21 UTILITIES ON ONE DISK
BY BERT KERSEY

LIST FORMATTER prints each program statement on a new line. Loops indented with printer page breaks. A great de-bugger! Also...

MULTI-COLUMN catalogs for printouts, auto-post Run-number & Date in programs, put invisible commands in programs, create INVISIBLE file names, alphabetize/store info on disk, convert decimal to hex or INT to FP, renumber to 65535, append programs, dump text-screen to printer...

MORE TOO: 21 Programs Total, a best-seller!

UTILITY CITY $29.50
(includes Peeks/Pokes Chart & Tip Book*3)

```
10  FOR A = 1 TO 22: PRINT CHR$(ASC (MID$(
    "IJ—!IPX(T!ZPVS!TJTUFS@", A, 1))—A/A);
20  FOR B = 1 TO 4: C = PEEK(49200): NEXT B, A
```

DOS Boss

DISK COMMAND EDITOR
BY BERT KERSEY & JACK CASSIDY

RENAME COMMANDS & ERROR MESSAGES: "Catalog" can be "C"; "Syntax Error" can be "Oops" or anything you want. Protect your programs; unauthorized save-attempt can produce "Not Copyable" message. Also LIST-prevention and one-key program-run from catalog.

CUSTOMIZE DOS: Change Disk Volume heading to your message. Omit/alter catalog file codes. Fascinating documentation and tips; hours of juicy reading and Apple experiments.

ANYONE USING YOUR DISKS (booted or not) will be formatting DOS the way you designed it.

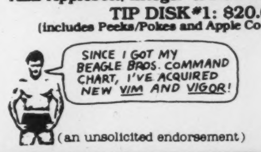
DOS BOSS: $24.00
(includes Peeks/Pokes Chart, DOS Book & Tip Book*2)

Tip Disk*1

100 TIP BOOK TIPS ON DISK
BY BERT KERSEY

100 LISTABLE PROGRAMS from Beagle Bros Tip Books 1-4. Make your Apple do things its never done! All programs changeable for experimentation. Includes our Apple Command Chart: ALL Applesoft, Integer & DOS Commands!

TIP DISK*1: $20.00
(includes Peeks/Pokes and Apple Command Charts)


SINCE I GOT MY BEAGLE BROS. COMMAND CHART, I'VE ACQUIRED NEW VIM AND VIGOR!

(an unsolicited endorsement)

"APPLE" is a registered trade mark of You-Know-Who.

GOTO your Apple Dealer for Beagle Bros disks.

NEW!

ProntoDOS

HIGH-SPEED DISK UTILITY
BY TOM WEISHAAR

HIGH-SPEED DOS! Take a look—

Function	Normal	Pronto
BLOAD HI-RES IMAGE	10 sec.	3 sec.
BSAVE HI-RES IMAGE	12 sec.	6 sec.
LOAD 60-SECTOR PROGRAM	16 sec.	4 sec.
SAVE 60-SECTOR PROGRAM	24 sec.	9 sec.
BLOAD LANGUAGE CARD	13 sec.	4 sec.
TEXT FILES	(no change)	

BOOT PRONTO-DOS or any updated normal-3.3 disk. Create new ProntoDos disks with the normal INIT command. ProntoDos is compatible with ALL DOS COMMANDS and performs normally with almost ALL programs, including CopyA.

MORE DISK SPACE: ProntoDos frees-up 15-extra-sectors per disk, almost one full track!

PRONTO-DOS: $29.50
(includes Peeks/Pokes Chart)

Alpha Plot

HI-RES GRAPHICS/TEXT UTILITY
BY BERT KERSEY & JACK CASSIDY

DRAW IN HI-RES, on 2 pages, using keyboard or paddles/joystick. See lines before plotting. Mixed-colors and reverse (background opposite). Fast circles, boxes and ellipses; filled or outlined.

COMPRESS HI-RES PIX to 1/3 Disk-Space. Superimpose pages or re-locate any rectangular image area anywhere on either hi-res page.

HI-RES TEXT: Proportional spacing, adjustable character size and color, upper/lower case, no tab limits, sideways typing for graphs.

ALPHA PLOT: $39.50
(includes Peeks/Pokes Chart & Tip Book*4)

Beagle Bros™
MICRO SOFTWARE

Where to Buy Beagle Bros Disks:

MOST APPLE DEALERS carry Beagle Bros software. If yours doesn't, get on his case. Or order directly from us for IMMEDIATE SHIPMENT—

Visa/MasterCard/COD, Call **TOLL FREE**

Nationwide: 1-800-854-2003, ext. 827
California: 1-800-522-1500, ext. 827
Alaska/Hawaii: 1-800-854-2622, ext. 827

OR mail U.S.check, money order or Visa/MC nos.
to **BEAGLE BROS**, Dept. C
4315 SIERRA VISTA / SAN DIEGO, CA 92103

Please add $1.50 First Class shipping, any size order. Overseas add $4. COD add $3. California add 6%.

ALL ORDERS SHIPPED IMMEDIATELY.

CIRCLE 118 ON READER SERVICE CARD

```
2570  VTAB 11: PRINT IS$(9);J9: INPUT L: IF L <  >  - 1 THEN J9 = L
2580  VTAB 12: PRINT IS$(10);JA: INPUT L: IF L <  >  - 1 THEN JA = L
2590  VTAB 13: PRINT IS$(11);JB: INPUT L: IF L <  >  - 1 THEN JB = L
2600  VTAB 14: PRINT IS$(12);JC: INPUT L: IF L <  >  - 1 THEN JC = L
2610  VTAB 15: PRINT IS$(13);JD: INPUT L: IF L <  >  - 1 THEN JD = L
2620  VTAB 16: PRINT IS$(14);JE: INPUT L: IF L <  >  - 1 THEN JE = L
2630  VTAB 17: PRINT IS$(15);JF: INPUT L: IF L <  >  - 1 THEN JF = L
2640 HO = 1
2650  IF HO = 2 THEN  PRINT D$;"PR#1"
2660  HOME
2670  PRINT "    INCOME STATEMENT DATA"
2680  VTAB 3: PRINT IS$(1);J1
2690  VTAB 4: PRINT IS$(2);J2
2700  VTAB 5: PRINT IS$(3);J3
2710  VTAB 6: PRINT IS$(4);J4
2720  VTAB 7: PRINT IS$(5);J5
2730  VTAB 8: PRINT IS$(6);J6
2740  VTAB 9: PRINT IS$(7);J7
2750  VTAB 10: PRINT IS$(8);J8
2760  VTAB 11: PRINT IS$(9);J9
2770  VTAB 12: PRINT IS$(10);JA
2780  VTAB 13: PRINT IS$(11);JB
2790  VTAB 14: PRINT IS$(12);JC
2800  VTAB 15: PRINT IS$(13);JD
2810  VTAB 16: PRINT IS$(14);JE
2820  VTAB 17: PRINT IS$(15);JF
2830  PRINT D$;"PR#0"
2840  VTAB 23: INPUT "MODIFY=1, PRINTER=2, MENU=3 ";T: IF T = 1 THEN 2490
2850  IF T = 2 THEN HO = 2
2860  IF T = 2 THEN 2650
2870  IF T = 3 THEN  RETURN
2880  IF T > 3 OR T < 1 THEN 2840
2890  REM  S=3 STOCK DATA
2900  HOME : PRINT "       INPUT THE STOCK DATA"
2910  VTAB 3: PRINT IS$(16);S3: INPUT L: IF L <  >  - 1 THEN S3 = L
2920  VTAB 4: PRINT IS$(17);S4: INPUT L: IF L <  >  - 1 THEN S4 = L
2930  VTAB 5: PRINT IS$(18);S5: INPUT L: IF L <  >  - 1 THEN S5 = L
2940  VTAB 6: PRINT IS$(19);S6: INPUT L: IF L <  >  - 1 THEN S6 = L
2950  VTAB 7: PRINT IS$(20);S7: INPUT L: IF L <  >  - 1 THEN S7 = L
2960  VTAB 8: PRINT IS$(21);S8: INPUT L: IF L <  >  - 1 THEN S8 = L
2970  VTAB 9: PRINT IS$(22);SB: INPUT L: IF L <  >  - 1 THEN SB = L
2980 HO = 1
2990  IF HO = 2 THEN  PRINT D$;"PR#1"
3000  HOME
3010  PRINT "        STOCK DATA "
3020  VTAB 3: PRINT IS$(16);S3
3030  VTAB 4: PRINT IS$(17);S4
3040  VTAB 5: PRINT IS$(18);S5
3050  VTAB 6: PRINT IS$(19);S6
3060  VTAB 7: PRINT IS$(20);S7
3070  VTAB 8: PRINT IS$(21);S8
3080  VTAB 9: PRINT IS$(22);SB
3090 T = 0
3100  PRINT D$;"PR#0"
3110  VTAB 23: INPUT "MODIFY=1, PRINTER=2, MENU=3 ";T: IF T = 1 THEN 2900
3120  IF T = 2 THEN HO = 2
3130  IF T = 2 THEN 2990
3140  IF T = 3 THEN  RETURN
3150  IF T > 3 OR T < 1 THEN 3110
3160  REM   LIQUIDITY RATIO S=4
3170  HOME : REM  LIQUIDITY RATO
3180 HO = 1
3190  IF HO = 2 THEN  PRINT D$;"PR#1"
3200 C1 = K4 - K9: REM  WORKING CAPITAL
3210 W1 = K4 / K9: REM  CURRENT RATIO
3220 W2 = K3 / (K4 - K9): REM  INVENTORY TO WORKING CAPITAL
```

```
3230 W3 = K9 / K3: REM  CURRENT DEBT TO INVENTORY
3240 W4 = (K4 - K3) / K9: REM   QUICK RATIO
3250 T = 100 * W1:X% = T:W1 = X%:W1 = W1 / 100
3260 T = 100 * W2:X% = T:W2 = X%:W2 = W2 / 100
3270 T = 100 * W3:X% = T:W3 = X%:W3 = W3 / 100
3280 T = 100 * W4:X% = T:W4 = X%:W4 = W4 / 100
3290  REM  NOW OUTPUT RESULTS
3300  PRINT  TAB( 9)"*** LIQUIDITY RATIOS ***"
3310  PRINT : PRINT LR$(1); TAB( 32);W1: PRINT DB$
3320  PRINT : PRINT LR$(2); TAB( 32);W2: PRINT DB$
3330  PRINT : PRINT LR$(3); TAB( 32);W3: PRINT DB$
3340  PRINT : PRINT LR$(4); TAB( 32);W4: PRINT DB$
3350  PRINT : PRINT  TAB( 9);MI$
3360  PRINT
3370  PRINT LM$(1); TAB( 32);C1
3380  PRINT LM$(2); TAB( 32);K9
3390  PRINT LM$(3); TAB( 32);K4
3400  PRINT LM$(4); TAB( 32);K3
3410  PRINT D$;"PR#0"
3420  VTAB 23: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
3430  IF T = 2 THEN HO = 2
3440  IF T = 2 THEN 3190
3450  REM  LEVERAGE RATIOS S=5
3460  HOME : REM  LEVERAGE RATIOS
3470 HO = 1
3480  IF HO = 2 THEN  PRINT D$;"PR#1"
3490 XX = KD - K6
3500 YY = JA - JB: REM  AFTER TAX PROFIT
3510 L1 = (KA + K9) / XX: REM  TOTAL DEBT TO NET WORTH
3520 L2 = K9 / XX: REM    CURRENT DEBT TO NET WORTH
3530 L3 = K5 / XX: REM   FIXED ASSETS TO NET WORTH
3540 L4 = (J6 + J9) / J9: REM  TIMES INTEREST EARNED
3550 T = 100 * L1:X% = T:L1 = X%:L1 = L1 / 100
3560 T = 100 * L2:X% = T:L2 = X%:L2 = L2 / 100
3570 T = 100 * L3:X% = T:L3 = X%:L3 = L3 / 100
3580 T = 100 * L4:X% = T:L4 = X%:L4 = L4 / 100
3590  REM  NOW OUTPUT RESULTS
3600  PRINT  TAB( 9)"*** LEVERAGE RATIOS ***"
3610  PRINT : PRINT RR$(1); TAB( 32);L1: PRINT DB$
3620  PRINT : PRINT RR$(2); TAB( 32);L2: PRINT DB$
3630  PRINT : PRINT RR$(3); TAB( 32);L3: PRINT DB$
3640  PRINT : PRINT RR$(4); TAB( 32);L4: PRINT DB$
3650  PRINT : PRINT  TAB( 9);MI$
3660  PRINT
3670  PRINT RM$(1); TAB( 32);XX
3680  PRINT RM$(2); TAB( 32);K9
3690  PRINT RM$(3); TAB( 32);KA
3700  PRINT RM$(4); TAB( 32);K5
3710  PRINT RM$(6); TAB( 32);J9
3720  PRINT D$;"PR#0"
3730  VTAB 23: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
3740  IF T = 2 THEN HO = 2
3750  IF T = 2 THEN 3480
3760  HOME : REM  ACTIVITY RATIOS S=6
3770 HO = 1
3780  IF HO = 2 THEN  PRINT D$;"PR#1"
3790 A1 = J1 / K3: REM  INVENTORY TURNOVER
3800 A2 = K2 * 365 / J1: REM  COLLECTION PERIOD
3810 A3 = J1 / K5: REM  FIXED ASSET TURNOVER
3820 A4 = J1 / (K4 - K9): REM  WORKING CAPITAL TURNOVER
3830 A5 = J1 / K7: REM  TOTAL ASSET TURNOVER
3840 A6 = K2 * 360 / J1
3850 T = 100 * A1:X% = T:A1 = X%:A1 = A1 / 100
3860 T = 10 * A2:X% = T:A2 = X%:A2 = A2 / 10
3870 T = 100 * A3:X% = T:A3 = X%:A3 = A3 / 100
3880 T = 100 * A4:X% = T:A4 = X%:A4 = A4 / 100
```

HUNTINGTON COMPUTING

ONE OF THE WORLD'S LARGEST INVENTORIES

Softlights

By Fred Huntington

AD FORMAT

We always try to be a little different. Now we're noticing everyone else is copying our style of ads. So we're presenting things a little differently this month. When you call or write, will you let us know how you like this format?

We assume that by now you know we stock just about everything under the sun for Apple and Atari computers. So this time we're going to list some of the more unusual items. If other computer stores sell it, you can just about figure you can get it from Huntington.

JADED

I admittedly get a little jaded when I play all the new games. Something really has to be good to catch my attention now. When I first played Datamost's Crazy Mazey, however, I knew I was hooked. You have miniature cars chasing you. If you can maneuver just right, you can make them crash into each other. Seven different speeds and lots of fun. ($29.95) sale price **$23.99.**

We have a large number of new games by Avalon Hill. Also, there are several new books on using VisiCalc. Rainbow Computing has a good new proigram called Statistics with Daisy.

Watch for some great new things coming from Zeitgeist.

Other good bets are The Routine Machine by SDS and DARK, the disk Repair Kit. You can figure that most of our prices are at least fifteen percent off list. Pie-Man from Penguin Software is a cute game.

EDUCATIONAL SOFTWARE

Some of the finest educational games we've seen come from Spinnaker. I highly recommend Snooper Troops #1 and Snooper Troops #2 for any elementary through high school gifted classes. HIRES graphics and professionally done, these games will teach your youngsters those elusive higher levels of thinking. (List $44.95, our price **$37.99**.)

Also from Spinnaker are Story Machine and Face Maker (list $34.95, our price **$28.99**.) Face Maker is supposed to be for early elementary and pre-school. I has a blast with it. If you're coming home from your 200,000-dollar-a-year job and are completely bushed, throw in Face Maker and be a kid again and have a lot of fun. A perfect gift for the executive who has everything.

The Learning Co. has some great new programs and we stock them all with 15% off list.

We have Great Grandma Huntington Tee-shirts back in stock. They are Hanes shirts, white with red trim. One the front is a picture of Great Grandma Huntington with the words "Great Grandma Huntington Cared." On the back it says Huntington Computing, Corcoran, California.

I get more comments on these tee-shirts than any I have ever worn. Please specify small, medium, large, or extra large. Supply is limited so please hurry.

We even have grab bags for **$5.00.** Specify disk (one disk) or cassette (two cassettes). We don't guarantee these. Some are great, some are just shop worn and some are downright lousy. Order five of them and you get them for $20.00. Only while supply lasts.

RANA DRIVES

I love my Rana disk drives. Call us and we'll quote you an excellent price. We're also carrying Fourth Dimension drives.

Are you always changing cards because you've run out of room in your Apple. SO. CAL. Research now presents the Extend-A-Slot which brings a slot outside your Apple, allowing an easy change of cards. The 18" flex cable is long enough to allow placement of the card in a convenient location. The high quality connectors are gold-plated for reliability. Our price **$27.99.**

ROOTS

We're rooting for two new programs from Quinsept — Lineages (**$89.00** our price) and Family Roots (**$169.00** our price). Quinsept says that Family Roots is the most comprehensive genealogy package for the microcomputer available. It was developed as an upgrade to Lineages based on many user comments and requests, including those of professional genealogists. It has the functions needed for pursuing genealogy seriously.

Want a solderless shift-key modification? Only $15.00 and does not give directions. (Most word processor programs give directions.)

Type Attack from Sirius is a learn-to-type game unlike anything on the market. This will not replace MasterType. Both are excellent in their own way. Until Jan. 30, you can have either for **$29.99.**

We also have all the Synapse, APX, Broderbund, Datasoft, Don't Ask, Edu-Ware, Gebelli, Infocom, In-Home, On-Line, Roklan, Sirius programs at 15% off list. You name it, we carry it.

TAX DODGE

Island Graphics, a new name in Ataridom has a super new 32K disk game called Tax Dodge. The scrolling effect is incredible. You go through areas of red tape and inflation while trying to glide down the deductions column.

Tax Dodge was written by Jon Freeman and Anne Westfall. Freeman also wrote Crush, Crumble, and Chomp and Temple of Apshai. The list price is $39.95 but until Jan. 30 you can have it for **$29.94.** I think you'll be very happy with this game.

APPLEFEST

At the Applefest in San Francisco I got together with the Corona people. After seeing their **10MB hard disk,** I couldn't resist and bought one for my personal use. I am very excited about it. It seems to be the easiest to use with the fewest restrictions.

The list price fpr the 10MB is $2995 and our price is **$2499.** It takes ten minutes or less to install and we will support our customers.

To go along with the hard disk is a new gadget I'm almost embarrassed to admit that we carry — the Wildcard. With the Wildcard and another $20 program, you'll be able to put many of your favorite programs on hard disk.

When you purchase the Wildcard from us, you must agree that it is only for backup purposes and you will not distribute, sell, give away, or trade any of the copies you make. If you do not agree to this, we don't want to sell it to you.

I feel making backup copes for yourself is valid. I also feel that the authors should receive their royalties.

Our cost for the Wildcard is **$119.**

We also have AbCom disk drive extenders for the Apple for **$17.99.** A great new game from Mind Games is The Desecration. It's an adventure game with three arcade games interspersed. We have it at a discount.

Best new game for the Apple in many months is Datamost's Aztec. You won't believe how great this one is. It sets a new standard for adventure games combining super HIRES graphics with unbelievable animation. List price is $39.95; our sale price is **$29.99.** Another incredible game is Mask of the Sun and we have it in stock.

ATARI ATARI ATARI

We stock all the very latest games for Atari. We have everything from remote-controlled joy sticks to the fanciest word processors and games. If you see it advertised in the magazines, we can almost certainly get it for you at a discount. Chances are, we already have it in stock.

HUNTINGTON COMPUTING,
Post Office Box 787
Corcoran, California 93212

Order by phone 1-800-344-5106
In California 1-800-692-4146

SUPER DISCOUNTS

VISA

master charge

We take MasterCard or VISA (Include card # and expiration date). California residents add 6% tax. Include $2.00 for postage. Foreign and hardware extra. Send for free catalog. Prices subject to change.

CIRCLE 187 ON READER SERVICE CARD

```
3890 T = 100 * A5:X% = T:A5 = X%:A5 = A5 / 100
3900 T = 10 * A6:X% = T:A6 = X%:A6 = A6 / 10
3910  REM  NOW OUTPUT RESULTS
3920  PRINT  TAB( 9)"*** ACTIVITY RATIOS ***"
3930  PRINT : PRINT AR$(1); TAB( 32);A1: PRINT DB$
3940  PRINT : PRINT AR$(2); TAB( 32);A2: PRINT DB$
3950  PRINT : PRINT AR$(3); TAB( 32);A3: PRINT DB$
3960  PRINT : PRINT AR$(4); TAB( 32);A4: PRINT DB$
3970  PRINT : PRINT AR$(5); TAB( 32);A5
3980  PRINT : PRINT AR$(6); TAB( 32);A6
3990  PRINT : PRINT  TAB( 9);MI$
4000  PRINT
4010  PRINT AM$(1); TAB( 32);J1
4020  PRINT AM$(2); TAB( 32);K2
4030  PRINT AM$(3); TAB( 32);K8
4040  PRINT D$;"PR#0"
4050  VTAB 24: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
4060  IF T = 2 THEN HO = 2
4070  IF T = 2 THEN 3780
4080  REM  S=7 PROFITABILITY RATIOS
4090  HOME : REM  NOW CALCULATE A FEW NUMBERS
4100 HO = 1
4110  IF HO = 2 THEN  PRINT D$;"PR#1"
4120 YY = JA - JB
4130 XX = KD - K6
4140 P1 = YY / XX: REM  RETURN ON NET WORTH
4150 P2 = YY / J1: REM  SALES MARGIN
4160 P3 = (J8 - JB) / K7: REM  TOTAL ASSET PRODUCTIVITY
4170 P4 = J3 / J1: REM  GROSS PROFIT TO SALES
4180 P5 = J4 / J1: REM  OPERATING PROFIT TO SALES
4190 T = 1000 * P1:X% = T:P1 = X%:P1 = P1 / 1000
4200 T = 1000 * P2:X% = T:P2 = X%:P2 = P2 / 1000
4210 T = 1000 * P3:X% = T:P3 = X%:P3 = P3 / 1000
4220 T = 1000 * P4:X% = T:P4 = X%:P4 = P4 / 1000
4230 T = 1000 * P5:X% = T:P5 = X%:P5 = P5 / 1000
4240  REM  NOW OUTPUT RESULTS
4250  PRINT  TAB( 6)"*** PROFITABILITY RATIOS ***"
4260  PRINT : PRINT PR$(1); TAB( 32);P1: PRINT DB$
4270  PRINT : PRINT PR$(2); TAB( 32);P2: PRINT DB$
4280  PRINT : PRINT PR$(3); TAB( 32);P3: PRINT DB$
4290  PRINT : PRINT PR$(4); TAB( 32);P4
4300  PRINT : PRINT PR$(5); TAB( 32);P5
4310  PRINT : PRINT  TAB( 9);MI$
4320  PRINT
4330  PRINT PM$(1); TAB( 32);YY
4340  PRINT PM$(2); TAB( 32);XX
4350  PRINT PM$(3); TAB( 32);J1
4360  PRINT PM$(4); TAB( 32);J8
4370  PRINT PM$(5); TAB( 32);J3
4380  PRINT D$;"PR#0"
4390  VTAB 23: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
4400  IF T = 2 THEN HO = 2
4410  IF T = 2 THEN 4110
4420  REM  S=8 COVERAGE RATIOS
4430  HOME
4440 HO = 1
4450  IF HO = 2 THEN  PRINT D$;"PR#1"
4460 C1 = J8 / (J9 + JE + (JF / .52)): REM  FIXED CHARGE COVERAGE
4470 C2 = (JA + J9 + JE) / (J9 + JE + (JF / .52)): REM  DEBT
     SERVICE COVERAGE
4480 T = 100 * C1:X% = T:C1 = X%:C1 = C1 / 100
4490 T = 100 * C2:X% = T:C2 = X%:C2 = C2 / 100
4500  REM  NOW OUTPUT RESULTS
4510  PRINT  TAB( 9)"*** COVERAGE RATIOS ***"
4520  PRINT : PRINT CR$(1); TAB( 32);C1
4530  PRINT : PRINT CR$(2); TAB( 32);C2
4540  PRINT : PRINT  TAB( 9);MI$
4550  PRINT
4560  PRINT CM$(1); TAB( 32);JA
4570  PRINT CM$(2); TAB( 32);J9
4580  PRINT CM$(3); TAB( 32);JE
4590  PRINT CM$(4); TAB( 32);JF
4600  PRINT CM$(5); TAB( 32);J5
4610  PRINT D$;"PR#0"
4620  VTAB 23: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
4630  IF T = 2 THEN HO = 2
4640  IF T = 2 THEN 4450
4650  REM  S=9 STOCK RATIOS
4660  HOME
4670 HO = 1
4680  IF HO = 2 THEN  PRINT D$;"PR#1"
4690 YY = JA - JB
4700 S1 = YY / SB: REM  EARNINGS PER SHARE
4710 S2 = S3 / S1: REM  PRICE TO EARNINGS
4720 S9 = S6 + (S7 * (S5 - S6)): REM  CAPM RATE
4730 SA = 100 * (S4 * (1 + (S8 / 100))) / (S5 - S8): REM  PRICE
4740 T = 1000 * S1:X% = T:S1 = X%:S1 = S1 / 1000
4750 T = 10 * S2:X% = T:S2 = X%:S2 = S2 / 10
4760 T = 1000 * S9:X% = T:S9 = X%:S9 = S9 / 1000
4770 T = 10 * SA:X% = T:SA = X%:SA = SA / 10
4780  REM  NOW OUTPUT RESULTS
4790  PRINT  TAB( 11)"*** STOCK DATA ***"
4800  PRINT : PRINT SR$(1); TAB( 32);S1
4810  PRINT : PRINT SR$(2); TAB( 32);S2
4820  PRINT : PRINT SR$(3); TAB( 32);S3
4830  PRINT : PRINT SR$(4); TAB( 32);S4
4840  PRINT : PRINT SR$(5); TAB( 32);S5
4850  PRINT : PRINT SR$(6); TAB( 32);S6
4860  PRINT : PRINT SR$(7); TAB( 32);S7
4870  PRINT : PRINT SR$(8); TAB( 32);S8
4880  PRINT : PRINT SR$(9); TAB( 32);S9
4890  PRINT : PRINT SR$(10); TAB( 32);SA
4900  PRINT D$;"PR#0"
4910  VTAB 23: INPUT "MENU=1, PRINTER=2 ";T: IF T = 1 THEN  RETURN
4920  IF T = 2 THEN HO = 2
4930  IF T = 2 THEN 4680
4940 OT = 2: RETURN : REM  S=10
4950  REM  IF PEEK(222)=255 THEN 500
4960  HOME : VTAB 12
4970  PRINT  CHR$ (7);"ERROR NUMBER "; PEEK (222);" IN LINE "; PEEK (219) * 256
+  PEEK (218)
4980  VTAB 22: PRINT "HIT RETURN TO CONTINIUE ";: GET A$; GOTO 2050
4990  HOME : GOSUB 5000: FOR I = 1 TO 7: PRINT "**"; TAB( 38);"**": NEXT : GOSUB
 5000: RETURN
5000  FOR I = 1 TO 38: PRINT "*";: NEXT : PRINT "*": RETURN
5010  POKE 32,4: VTAB 4: PRINT "  MAIN MENU OF THE FINANCIAL": PRINT : PRINT "
  RATIOS ANALYSIS PROGRAM": TEXT
5020  FOR I = 1 TO 11: VTAB I + 10: HTAB 5: PRINT I;". ";OP$(I): NEXT : RETURN
5030  VTAB 24: INPUT "   SELECTION  ->";S: IF S < 1 OR S > 11 THEN  PRINT  CHR$
(7): VTAB 24: CALL  - 958: GOTO 5030
5040  RETURN
5050  HOME : END
```

Disk Drive for Apple $289.95

Modems

SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A	*Signalman*	**$89.95**

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A	*Smartmodem*	**$224.95**
IOK-1500A	*Hayes Chronograph*	**$218.95**
IOM-2010A	*Micromodem II*	**$328.95**
IOM-2012A	*Terminal program for MMII*	**$89.95**
IOM-1100A	*Micromodem 100*	**$368.95**

APPLE-CAT - Novation

Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dial,touch & pulse dialing, auxiliary 3-wire RS-232C serial port for printer

IOM-5232A	*Save $50.00*	**$324.95**

1200 BAUD SMARTMODEM - Hayes

1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.

IOM-5500A	*Smartmodem 1200*	**$599.95**

1200 BAUD AUTO CAT - Novation

212 Auto Cat, 1200 & 300 baud, auto dial/answer/disconnect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.

IOM-5231A	*212 Auto Cat*	**$649.95**

Video Monitors

HI-RES 12" GREEN - Zenith

15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201	*List price $189.95*	**$129.95**

12" GREEN SCREEN - NEC

20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.

VDM-651200	*Deluxe model*	**$199.95**
VDM-651260	*Economy model*	**$149.95**

12" COLOR MONITOR - NEC

High resolution color monitor with audio.

VDC-651212	*Color monitor*	**$389.95**
NEC-1202D	*RGB color monitor*	**$999.95**

13" COLOR MONITORS - BMC

18 MHz RGB & composite video color monitors.

VDC-421320	*13" RGB Color*	**$369.95**
VDC-421310	*13" Composite video*	**$329.95**
VDX-420090	*RGB card for Apple*	**$149.95**

COLOR MONITORS - Amdek

Reasonably priced color video monitors.

VDC-80130	*13" Color I*	**$379.95**
VDC-801320	*13" Color II*	**$894.95**
IOV-2300A	*DVM board for Apple*	**$199.95**

AMBER or GREEN MONITORS - Jade

High resolution 18 MHz compact video monitors.

VDM-751210	*12" Amber phosphor*	**$149.95**
VDM-751220	*12" Green phosphor*	**$139.95**
VDM-750910	*9" Amber phosphor*	**$149.95**
VDM-750920	*9" Green phosphor*	**$139.95**

EPROM Erasers

ULTRA-VIOLET EPROM ERASERS

Inexpensive erasers for industry or home.

XME-3100A	*Spectronics w/o timer*	**$69.50**
XME-3101A	*Spectronics with timer*	**$94.50**
XME-3200A	*Economy model*	**$39.95**

CP/M 3.0 Upgrade

NEW CP/M 3.0 - Digital Research

CP/M 3.0 is Digital Research's latest version of the industry standard disk operating system. It features many performance improvements such as intelligent record buffering, improved directory handling, "HELP" facility, time/date stamping of files and many more improvements. AND A TREMENDOUS INCREASE IN SPEED !!!, it is fully CP/M 2.2 compatible and requires no changes to your existing application software. Available only to Versafloppy II owners with SBC-200 CPU's

SFC-55009057F	*CP/M 3.0 8" with manuals*	**$200.00**
SFC-55009057D	*CP/M 3.0 manual set*	**$30.00**

Apple II Accessories

APPLE DISK DRIVE - Fourth Dimension

Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

MSM-123200	*40 Track add on Apple drive*	**$289.95**
MSM-123200	*Controller with free DOS 3.3*	**$99.95**

16K RAM CARD - for Apple II

Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

MEX-16700A	*Save over $100.00*	**$69.95**

Z-80 CPU CARD - for Apple II

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M and complete manual set.

CPX-62800A	*A & T with software*	**$249.95**

APPLE-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A	*Save $50.00!!!*	**$325.95**

8" DISK CONTROLLER - Vista

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible

IOD-2700A	*A & T*	**$499.95**

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package	*Kit*	**$1495.00**
1 MegaByte Package	*A & T*	**$1695.00**
2 MegaByte Package	*Kit*	**$1795.00**
2 MegaByte Package	*A & T*	**$1995.95**

VISION 80 - Vista Computer

80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz

IOV-2400A	*Vista Vision 80*	**$299.95**

CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

IOX-2300A	*A & T*	**$179.95**

Power Strips

ISOBAR - GSC

Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed

EME-115103	*3 socket*	**$39.50**
EME-115105	*4 socket*	**$49.50**
EME-115100	*8 socket*	**$54.50**
EME-115110	*9 socket rackmount*	**$74.50**

Single Board Computer

SUPERQUAD - Adv. Micro Digital

Single board, standard size S-100 computer system, 4 MHz Z-80A, single or double density disk controller for 5¼" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible.

CPC-30800A	*A & T*	**$724.95**
IOX-4232A	*Serial I/O adapter*	**$29.95**

Z-80 STARTER KIT - SD Systems

Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook.

CPS-30100K	*Kit with workbook*	**$299.95**
CPS-30100A	*A & T with workbook*	**$469.95**

AIM-65 - Rockwell International

Complete 6502 microcomputer with alphanumeric display, printer, keyboard, & instruction manual.

CPK-50165A	*1K AIM-65*	**$424.95**
CPK-50465A	*4K AIM-65*	**$474.95**
SFK-74600008E	*8K Basic ROM*	**$64.95**
SFK-64600004E	*4K assembler ROM*	**$43.95**
SFK-74600020E	*PL/65 ROM*	**$84.95**
SFK-74600010E	*Forth ROM*	**$64.95**
SFK-74600030E	*Instant Pascal*	**$99.95**
PSX-030A	*Power supply*	**$64.95**
ENX-000002	*Enclosure*	**$54.95**

SPECIAL PACKAGE

4K AIM-65, 8K Basic, power supply, & enclosure

Special Package Price	**$649.95**

S-100 EPROM Boards

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer with software.

MEM-99520K	*Kit with software*	**$189.95**
MEM-99520A	*A & T with software*	**$249.95**

PB-1 - SSM Microcomputer

2708, 2716 EPROM board with on-board programmer.

MEM-99510K	*Kit with manual*	**$154.95**
MEM-99510A	*A & T with manual*	**$219.95**

EPROM BOARD - Jade

16K or 32K uses 2708 or 2716 EPROMs, 1K boundary.

MEM-16230K	*Kit w/o EPROMs*	**$79.95**
MEM-16230A	*A & T w/o EPROMs*	**$119.95**

S-100 Video Boards

SPECTRUM COLOR - CompuPro

Full-function color graphics board, up to 8 colors, 256 x 192 graphics, parallel I/O port, 8K RAM.

IOV-1870A	*A & T*	**$348.95**
IOV-1870C	*CSC*	**$398.95**

MICROANGELO - Scion

Ultra-high-resolution 512 x 480, 256 color or black & white S-100 video board

IOV-1500A	*A & T*	**$799.95**

S-100 MotherBoards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

6 Slot (5¼" x 8⅝")

MBS-061B	*Bare board*	**$22.95**
MBS-061K	*Kit*	**$39.95**
MBS-061A	*A & T*	**$69.95**

12 Slot (9¾" x 8⅝")

MBS-121B	*Bare board*	**$34.95**
MBS-121K	*Kit*	**$69.95**
MBS-121A	*A & T*	**$109.95**

18 Slot (14½" x 8⅝")

MBS-181B	*Bare board*	**$54.95**
MBS-181K	*Kit*	**$99.95**
MBS-181A	*A & T*	**$149.95**

ACTIVE TERMINATOR - CompuPro

A true mother's helper.

TSX-100A	*A & T*	**$59.45**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Free CP/M 3.0* !!!

S-100 CPU Boards

8086/8087 - CompuPro

16 bit, 8 or 10 MHz 8086 CPU with provisions for 8087 & 80130.

CPU-70520A	*8 MHz 8086 A & T*	**$624.95**
CPU-70520C	*8 MHz 8086 CSC*	**$764.95**
CPU-70530A	*with 8087 A & T*	**$1224.95**
CPU-70530C	*with 8087 CSC*	**$1455.95**

8085/8088 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory.

CPU-20510A	*6 MHz A & T*	**$398.95**
CPU-20510C	*6/8 MHz CSC*	**$497.95**

CPU-Z - CompuPro

2/4 MHz Z80A CPU, 24 bit addressing.

CPU-30500A	*2/4 MHz A & T*	**$279.95**
CPU-30500C	*3/6 MHz CSC*	**$374.95**

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.

CPC-30200A	*A & T*	**$329.95**

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.

CPU-30201B	*Bare board w/manual*	**$35.00**
CPU-30201K	*Kit with manual*	**$149.95**
CPU-30210A	*A & T with manual*	**$199.95**

CB-2 - SSM Microcomputer

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K	*Kit with manual*	**$229.95**
CPU-30300A	*A & T with manual*	**$274.95**

2810 Z-80 CPU - C.C.S.

2 or 4 MHZ Z-80 CPU with serial I/O port & on-board monitor PROM, front panel compatible.

CPU-30400A	*A & T with PROM*	**$289.95**

2820 Z-80 DMA CPU - C.C.S.

4 MHz Z-80 CPU board with 2 serial I/O ports & Centronics parallel I/O port, separate data & status ports, DMA daisy chain compatible.

CPU-30420A	*A & T with manual*	**$569.95**

S-100 Disk Controllers

DISK 1 - CompuPro

8" or 5¼" DMA disk controller, single or double density, single or double sided, 10 MHz.

IOD-1810A	*A & T*	**$449.95**
IOD-1810C	*CSC*	**$554.95**
SFC-52506580F	*8" CP/M 2.2 for Z-80*	**$174.95**
SFC-52506586F	*8" CP/M 2.2 for 8086*	**$299.95**
SFO-54158000F	*Oasis single user*	**$499.95**
SFO-54158002F	*Oasis multi-user*	**$849.95**

VERSAFLOPPY II - SD Systems

Double density disk controller for any combination of 5¼" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included.

IOD-1160A	*A & T with PROM*	**$359.95**
SFC-55009047F	*CP/M 2.2 with VF II*	**$99.95**

2242 DISK CONTROLLER - C.C.S.

5¼" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A	*A & T with CP/M 2.2*	**$399.95**

DOUBLE D - Jade

High reliablity double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

IOD-1200B	*Bare board & hdwr man*	**$59.95**
IOD-1200K	*Kit w/hdwr & sftwr man*	**$299.95**
IOD-1200A	*A & T w/hdwr & sftwr man*	**$325.95**
SFC-59002001F	*CP/M 2.2 with Double D*	**$99.95**

S-100 Memory Boards

256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

MEM-65064A	*64K A & T*	**$474.95**
MEM-65128A	*128K A & T*	**$574.95**
MEM-65192A	*192K A & T*	**$674.95**
MEM-65256A	*256K A & T*	**$774.95**
SFC-55009000F	*RAMDISK sftwr CP/M 2.2*	**$44.95**
SFC-55009000F	*RAMDISK with EXRAM III*	**$24.95**

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A	*A & T*	**$1609.95**
MEM-12810C	*CSC*	**$1794.95**

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A	*64K A & T*	**$549.95**
MEM-64180C	*64K CSC*	**$698.95**

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A	*RAM 16 A & T*	**$598.95**
MEM-32180C	*RAM 16 CSC*	**$698.95**

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A	*A & T*	**$499.95**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A	*64K A & T*	**$499.95**

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

MEM-99152B	*Bare board*	**$49.95**
MEM-99152K	*Kit less RAM*	**$99.95**
MEM-32152K	*32K kit*	**$199.95**
MEM-56152K	*56K kit*	**$289.95**
MEM-64152K	*64K kit*	**$299.95**
Assembled & Tested		**add $50.00**

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.

MEM-64566A	*64K A & T*	**$424.95**

64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A	*16K A & T*	**$344.95**
MEM-32631A	*32K A & T*	**$364.95**
MEM-48632A	*48K A & T*	**$384.95**
MEM-64633A	*64K A & T*	**$399.95**

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B	*Bare board w/manual*	**$49.95**
MEM-99730K	*Kit with no RAM*	**$179.95**
MEM-32731K	*32K kit*	**$199.95**
MEM-64733K	*64K kit*	**$249.95**
Assembled & Tested		**add $50.00**

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A	*16K A & T*	**$149.95**

Free CP/M 3.0 Offer

THREE BOARD SET - SD Systems

S-100 board set with 4 MHz Z-80A, 64K of RAM expandable to 256K, serial and parallel I/O ports, double-density disk controller for 5¼" and 8" disk drives, new and improved CP/M 3.0 manual set, system monitor, control and diagnostic software. Includes SD Systems SBC-200, 64K ExpandoRAM III, Versafloppy II, and FREE CP/M 3.0 - all boards are assembled & tested.

64K Board Set with FREE CP/M 3.0	**$1195.00**
256K Board Set with FREE CP/M 3.0	**$1395.00**

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A	*SS1 A & T*	**$359.95**
IOX-1850C	*SS1 CSC*	**$459.95**
IOX-1855A	*with 9511 A & T*	**$554.95**
IOX-1855C	*with 9511 CSC*	**$654.95**
IOX-1860A	*with 9512 A & T*	**$554.95**
IOX-1860C	*with 9512 CSC*	**$654.95**

INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A	*A & T*	**$218.95**
IOI-1810C	*CSC*	**$288.95**

INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

IOI-1835A	*5 port A & T*	**$558.95**
IOI-1835C	*5 port CSC*	**$628.95**
IOI-1838A	*8 port A & T*	**$628.95**
IOI-1838C	*8 port CSC*	**$749.95**

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A	*A & T*	**$314.95**
IOI-1840C	*CSC*	**$414.95**

MPX - CompuPro

Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

IOI-1875A	*4K MPX A & T*	**$444.95**
IOI-1875C	*4K MPX CSC*	**$534.95**
IOI-1880A	*16K MPX A & T*	**$584.95**
IOI-1880C	*16K MPX CSC*	**$674.95**

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Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

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I/O-5 - SSM Microcomputer

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IOI-1015A	*A & T*	**$289.95**

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IOI-1010A	*A & T with manual*	**$249.95**

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PRM-43083	*with FREE tractor*	***Call***

Microline 84 *132/232 column, Hi-speed 200 CPS, full dot graphics built in, plus all the features of the 83A.*

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PRM-43085	*Serial with 2K buffer*	***Call***

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PRA-27087	*TRS-80 cable*	**$24.95**
PRA-43081	*2K hi speed serial card*	**$99.95**
PRA-43082	*Hi-res graphics ROMs 82A*	**$49.95**
PRA-43083	*Hi-graphics ROMs 83A*	**$49.95**
PRA-43088	*Tractor option for 82A*	**$49.95**
PRA-43080	*Extra ribbons pkg. of 2*	**$9.95**

8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

NEC-8023A	*8023 parallel*	**$499.95**
NEC-8023-01	*8023 ribbon*	**$11.95**

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12 CPS daisy wheel printer from Smith Corona.

PRD-45101	*Centronics parallel*	**$648.95**
PRD-45102	*RS-232C serial*	**$648.95**

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5¼" Disk Drives

Tandon TM100-1	*single-sided double-density 48 TPI*		
MSM-551001		$219.95 ea	2 for **$199.95 ea**
Shugart SA400L	*single-sided double-density 40 track*		
MSM-104000		$234.95 ea	2 for **$224.95 ea**
Shugart SA455	*half-size double-sided 48 TPI*		
MSM-104550		$349.95 ea	2 for **$329.95 ea**
Shugart SA465	*half-size doule-sided 96 TPI*		
MSM-104650		$399.95 ea	2 for **$379.95 ea**
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MSM-551002		$294.95 ea	2 for **$269.95 ea**
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END-000216	*Single cab w/power supply*	**$69.95**
END-000226	*Dual cab w/power supply*	**$94.95**

8" Disk Drives

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MSF-108100		$424.95 ea	2 for **$394.95 ea**
Shugart SA860	*half-size double-sided double-density*		
MSF-108600		$574.95 ea	2 for **$549.95 ea**
Shugart SA801R	*single-sided double-density*		
MSF-10801R		$394.95 ea	2 for **$389.95 ea**
Shugart SA851R	*double-sided double-density*		
MSF-10851R		$554.95 ea	2 for **$529.95 ea**
Tandon TM848-1	*single-sided double-den thin-line*		
MSF-558481		$379.95 ea	2 for **$369.95 ea**
Tandon TM848-2	*double-sided double-den thin-line*		
MSF-558482		$494.95 ea	2 for **$484.95 ea**
Qume DT-8	*double-sided double-density*		
MSF-750080		$524.95 ea	2 for **$498.95 ea**
Mitsubishi M2894-63	*double-sided double-density*		
MSF-289463		$494.95 ea	2 for **$474.95 ea**
Siemens FDD 100-8	*single-sided double-density*		
MSF-201120		$274.95 ea	2 for **$249.00 ea**

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

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END-000421	*Cabinet kit*	**$225.00**
END-000431	*A & T*	**$359.95**

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256K PC/RAM - Hammond Engineering

* *User expandable from 64K to 256K, same high quality standards as the RAM Stack above, designed for medium memory expansion requirements.*

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MEX-128000A	*128K assembled & tested*	**$399.95**
MEX-192000A	*192K assembled & tested*	**$499.95**
MEX-256000A	*256K assembled & tested*	**$569.95**

PC/SASI RAM - Hammond Engineering

Three boards in one, 256K of RAM, RS-232 asynchronous serial interface, and a SASI (Shugart Assoc Standard Interface) hard disk interface.

IOX-6000A	*PC/SASI RAM*	**$1095.00**

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High quality extender card with free connectors for IBM PC bus.

TSX-300A	*A & T with connectors*	**$42.95**

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THE BUS PROBE - Jade

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The Taxman Cometh

ACRS Depreciation with the IBM PC.

Linda and Sid Broudy

"In this world," Benjamin Franklin observed, "nothing is certain but death and taxes." Well, old Ben was able to avoid the grim reaper for some 84 years, but, as Archie Goodwin reminded his boss, super-sleuth Nero Wolfe in the film version of Rex Stout's *The Doorbell Rang,* in April "the Tax Man cometh." Don't we know it!

The harbinger of tax time is the sudden metamorphosis of every previously vacant little store on Main Street into a "Tax Preparation Center." (The effect of this on the human psyche is a lot like Christmas in reverse.)

Nobody (at least nobody we know) looks forward to paying taxes. It is just one of those reminders of our "mere mortal" status. As we calculate our taxes, we try not to overlook ways to keep more of our hard earned dollars for ourselves. Indeed, it is our right to take advantage of legal tax deductions. One of those legal tax deductions is depreciation of business property.

It is not the purpose of this article to be a mini-treatise on depreciation. What we intend to do is briefly survey the relatively new method of depreciation known as ACRS, and present a program which will enable your personal computer to help you figure your ACRS deductions.

Background On ACRS Depreciation

According to the IRS, if you have qualifying property you use in business or hold for the production of income, you are allowed to deduct a part of the cost of the property each year. This deduction is called depreciation. Depreciation begins when you place the property in service. It ends when you take the property out of service or when you have recovered all of your cost.

The Economic Recovery Tax Act of 1981, as you are probably aware, brought about a number of changes in the law—and language—of depreciation. The Act created a new method of depreciation, the Accelerated Cost Recovery System (ACRS).

> ***The term "depreciation" seems to be going the way of the nickel Coke—the new lingo speaks of "recovery amount."***

Under this new system, the in-crowd no longer speaks of "depreciable property"; it is now "recovery property." The term "depreciation" seems to be going the way of the nickel Coke—the new lingo speaks of "recovery amount."

In general, you must use ACRS and its listed percentages for all assets you place in service after December 31, 1980. (However, you may elect to use an alternate method of figuring your deductions. This method is based on the straight line method and is used in place of the prescribed ACRS percentages.) Property placed in service before January 1, 1981, will continue to be depreciated in the same manner as in prior years.

Under ACRS, tangible depreciable property is depreciated over a 3-year, 5-year, 10-year, or 15-year recovery period, depending on the type of property it is. (The first three types of properties will be discussed later in this article. The fourth type, 15-year property, includes all real property, such as buildings, other than any designated as 10-year property. Since it is outside the area of concern of the average reader of this piece, 15-year property has not been included in the ACRS program.)

Let's now turn to the ACRS program itself, which calculates the ACRS deduction for the first three types of properties based on the percentages given in the IRS tables. The program will enable your computer to figure out, save to disk, and print out your ACRS deduction records. In the example we will use to guide you through the program, we will even allow your computer to be the star of the show. The ACRS program (see listing, below) was written for an IBM Personal Computer, but it can be modified without too much difficulty for most other micros. After you have entered the program and saved it to disk (perhaps as ACRS.BAS), we will run through the program together. Ready? Then let's go.

Running The Program

When you run the program, the first thing you will see on your screen are the words DEPRECIATION (ACRS) PROGRAM in inverse video. (We wanted to come on with a catchy phrase, like

---

Linda and Sid Broudy, P.O. Box 525, Brooklyn, NY 11230

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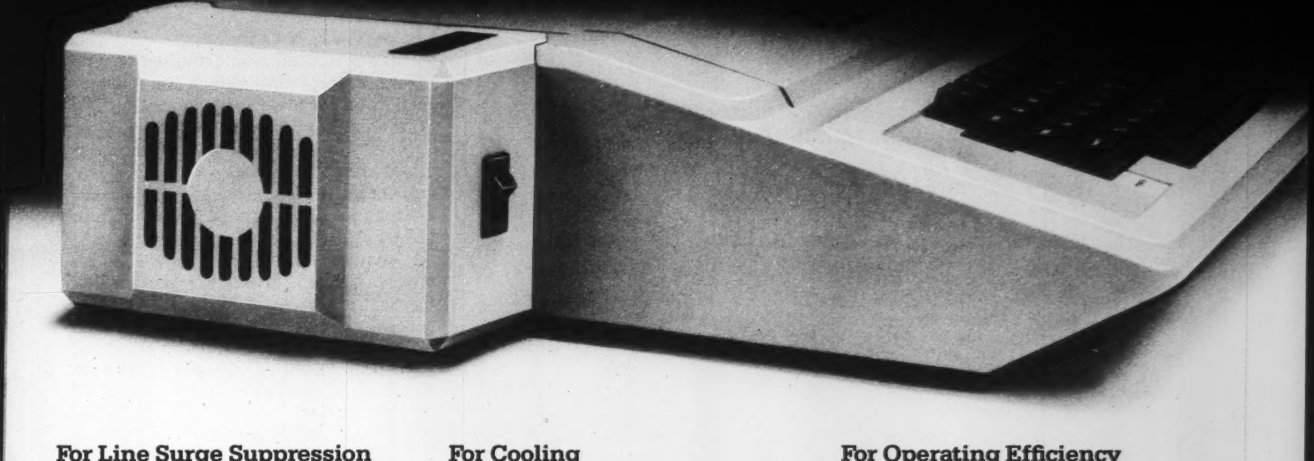
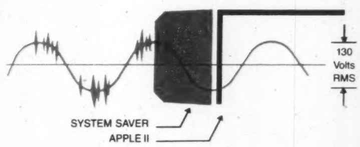


For Line Surge Suppression

The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

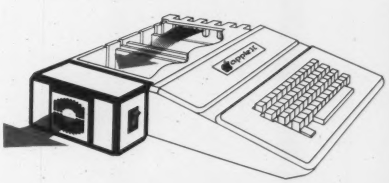


By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you move to 64K RAM or 80 columns on your Apple II you need SYSTEM SAVER.

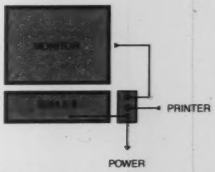
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.

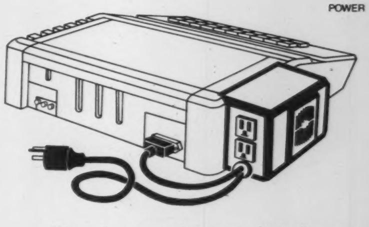


SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.





The heavy duty switch has a pilot light to alert when system is on. You'll never use the Apple power switch again!

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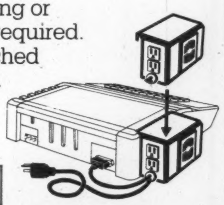
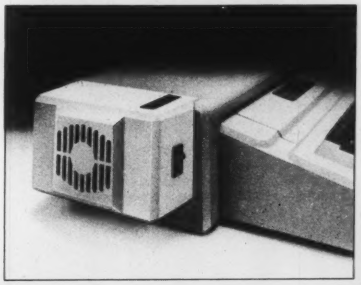
to Apple II.



UL LISTED

Compatible with Apple Stand



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CIRCLE 104 ON READER SERVICE CARD

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CIRCLE 152 ON READER SERVICE CARD

ACRS, continued...

"You are standing at the end of a road before a small brick building," but decided against it.)

You are first asked if you would like to read data from disk. Since this is the first time you are running the program, you obviously have no data to read yet, so answer N. You are next asked to type in your name, followed by a comma, and then your social security number. Let's do that: John Q. Public, 000-00-0000.

Now you are queried as to the item you wish to depreciate. As promised, we will enter the computer itself as the leading man (or, if you prefer, prima donna): IBM Personal Computer System.

You are now questioned as to the "recovery period" for the IBM Personal Computer System—3, 5, or 10 years. In general, 3-year property is personal property that has a midpoint class life of 4 years or less (e.g., automobiles, light duty trucks, and certain special tools), or is used for research and experimentation.

Ten-year property includes certain real property (such as theme park structures and certain public utility property), as well as manufactured homes.

Five-year property, says the IRS, is personal property "that is not 3-year property or 10-year property or 15-year public utility property." How's that for a catchall?

The 5-year group thus includes most other tangible depreciable personal property, such as the majority of equipment and machinery.

It appears from the above that the computer would be 5-year property, so let's enter 5. When you enter this number, the computer will keep it in mind and automatically do its depreciation figuring based on the right set of percentages. (The percentages contained in the program listing for 3-year property [lines 410-460], 5-year property [lines 470-520] and 10-year property [lines 530-600] are those set forth under the 1981 Tax Act for assets placed in service from 1981-1984.)

You are now asked for the unadjusted basis of the item. For property that you buy, your original basis is usually its cost to you. Assume that the purchase price for the computer system was $3000. Therefore, let's enter that amount (either as 3000 or 3000.00).

Next you are requested to supply the date the item was placed in service. Since the recovery deduction for personal property is not prorated for number of months in service the first year, it would probably be sufficient simply to enter 1982. However, if you prefer, the program allows you to make a full entry of month, date, and year (1-1-82).

Let's assume that the computer system is used for business purposes. Therefore, you enter 100 for the percentage of business use.

Finally, you are requested to enter the "depreciation year." In other words, you are being asked whether this is the first year of depreciation for this item, the second year, the third year, etc. In our example, this is the first year, so we'll enter 1. Well, that's all the information the computer needs; it is now ready to get to work.

The program now asks you if you wish a printout. Let's type Y to see what it looks like. (It should look like the printout appearing at the end of this article.) Notice that the printout is headed 5-YEAR DEPRECIATION (ACRS) WORKSHEET and includes your name and social security number. The computer has automatically performed the ACRS depreciation calculations for you at the prescribed rate of 15% (the first year rate for 5-year property), and pegged your deduction at $450.

Archie Goodwin was right, the Tax Man cometh.

You are then given the opportunity to look at another depreciation year (e.g., year "2") for the same item, or to enter information for a completely new item. (Although either or both of these options may be tempting, let's enter N for now.)

Finally, you are given the chance to save the depreciation information you entered earlier to disk. This is something you are urged to do. First, it will give you a permanent record of this information, and make it unnecessary to enter it again when you depreciate the item next year. (Remember that, unless Congress changes its mind, the percentages in this program should apply at least through 1984.)

Second, if you decide to depreciate anything else this year, you just "read from disk" at the beginning of the program, and are spared the task of reentering such information as your name and social security number. You can then not only enter another item (up to 10), but review any items you have entered previously. So let's type Y to save our data.

After that you are asked to name the file which will contain this data. Be sure you don't exceed eight alphanumeric symbols, as the extension. TAX will automatically be added to the file by the program. So let's save our data now as ACRS82.

Comments and Caveats

Well, there you have it—a program to help you with ACRS depreciation. After entering, saving, and running the program, you will be prepared to transfer the information to your tax return. (Form 4562 ("Depreciation"), Schedule A ("Itemized Deductions"—miscellaneous deduction if a qualified unreimbursed employee expense), Schedule C ("Profit or Loss From Business or Profession—Sole Proprietorship"), and/or Schedule E ("Supplemental Income Schedule") are the forms on which depreciation (recovery) amounts are usually recorded.)

There are two other provisions of the Economic Recovery Tax Act of 1981 that may be of interest to you. The first concerns "investment credit." If you buy certain tangible personal property for use (or partial use) in your trade or business, you may be able to claim an investment credit of up to 10% of the cost.

For assets placed in service after 1980, the eligible investment depends on the recovery period of the property under ACRS. (Investment credit is computed on Form 3468.) However, beginning in 1983 (i.e., for assets placed in service after 1982), you would have to subtract half the amount of the investment credit from the basis of the asset before computing the depreciation deduction, unless you are willing to reduce the credit by 2 percentage points.

The second provision of the 1981 Tax Act that relates closely to ACRS involves expensing. Under this provision, the taxpayer may currently elect to expense (deduct) up to $5000 of the cost of certain qualified property all in one year. The deduction is in lieu of the ACRS recovery amount and investment credit that would otherwise be allowed.

It goes without saying that it is vital to your financial well-being to review carefully all tax provisions which may affect you, and read up on any new tax items that may come down the pike, before figuring your depreciation deductions or, for that matter, your taxes as a whole. Professional counsel should, of course, be consulted regarding your individual tax situation.

We hope that this article—and program—will serve to remove at least some of the pain from April. Sure, Archie Goodwin was right, the Tax Man cometh—but at least we know that those flowers of May await us just a short way down the road. □

Sample ACRS program printout.

```
5 - YEAR DEPRECIATION (ACRS) WORKSHEET
JOHN Q. PUBLIC....................SS# 000-00-0000

COST RECOVERY FOR  IBM PERSONAL COMPUTER SYSTEM

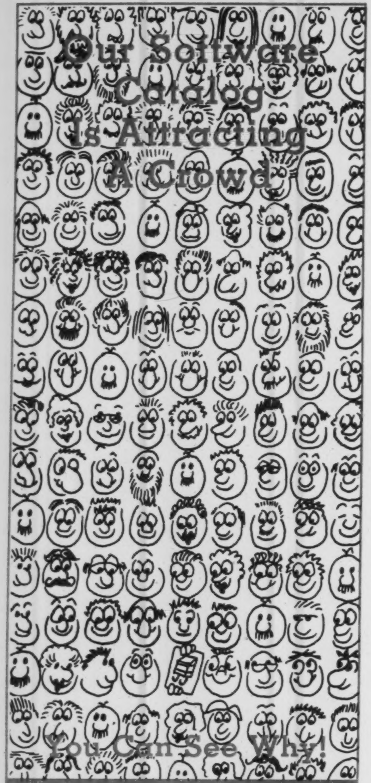
UNADJUSTED BASIS:   $3000.00
DATE PLACED IN SERVICE: 1982
DEPRECIATION YEAR:  1
RATE OF ACRS DEPRECIATION:  15 %

FULL ACRS DEPRECIATION AMT.  =   $450.00
PERCENT OF USE FOR BUSINESS:  100 %

ACRS DEPRECIATION DEDUCTION =    $450.00
```

Listing 1.

```
10 REM -- ACRS PROGRAM
20 REM -- BY L. AND S. BROUDY
25 REM -- SEPT. 1982
30 N=1
40 CLS:KEY OFF:COLOR 0,7:LOCATE 3,8:PRINT"DEPRECIATION (ACRS) PROGRAM":
   COLOR 7,0:PRINT
50 INPUT "WOULD YOU LIKE TO READ DATA FROM DISK   (Y/N)";ANS$
60 IF ANS$="Y" OR ANS$="y" THEN  710
70 IF ANS$="N" OR ANS$="n" THEN S=1
80 REM -- INSERTING NEW INFORMATION
90 INPUT "PLEASE TYPE IN YOUR NAME,AND YOUR SOCIAL SECURITY NUMBER
   (NAME,SS#)";N M$,SS$
100 INPUT "ITEM";IT$(N)
110 PRINT"IS THE RECOVERY PERIOD FOR ";IT$(N);" 3 YRS. 5 YRS, OR 10 YRS";:
    INPUT C(N)
115 IF C(N)=3 OR C(N)=5 OR C(N)=10 THEN GOTO 120 ELSE 110
120 INPUT "UNADJUSTED BASIS";BP(N)
130 INPUT "DATE PLACED IN SERVICE";S$(N)
140 INPUT "% USED FOR BUSINESS";B(N)
150 INPUT "DEPRECIATION YEAR (1,2,ETC.)";Y
160 IF C(N)=3 THEN GOSUB 410
170 IF C(N)=5 THEN GOSUB 470
180 IF C(N)=10 THEN GOSUB 530
190 INPUT "WOULD YOU LIKE A PRINTOUT";ANS$: IF ANS$="Y" OR ANS$="y"
    THEN GOSUB 850
```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ACRS, continued...

```
200 REM -- SCREEN DISPLAY
210 CLS: PRINT C(N) "- YEAR ACRS"
220 PRINT"COST RECOVERY FOR  ";IT$(N)
230 PRINT "UNADJUSTED BASIS: ";:PRINT USING "$$######.## ";BP(N)
240 PRINT:PRINT"DATE PLACED IN SERVICE: ";S$(N):PRINT "DEPRECIATION YEAR:
    ";Y
250 PRINT:PRINT"RATE OF ACRS DEPRECIATION: ";100*R;"%"
260 DEP=BP(N)*R
270 PRINT:PRINT"FULL ACRS DEPRECIATION AMT.  =";:PRINT USING
    "$$######.##";DEP
280 PRINT"PERCENT OF USE FOR BUSINESS:";B(N);"%":B=.01*B(N)
290 TD=B*DEP
300 PRINT:PRINT"ACRS DEPRECIATION DEDUCTION = ";:PRINT USING
    "$$######.##";TD
310 INPUT "DO YOU WANT ANOTHER DEPRECIATION YEAR   (Y/N)";A$
320 IF A$="Y" OR A$="y" THEN GOTO 150
330 IF A$="N" AND S=1 OR A$="n" AND S=1 THEN 370
340 INPUT"DO YOU WANT TO REVIEW ANOTHER ITEM FROM THE DISK (Y/N)";A$
350 IF A$="Y" OR A$="y" THEN 780
360 IF A$="N" OR A$="n"  THEN N=M
370 INPUT "DO YOU WANT TO ENTER ANOTHER ITEM (Y/N)";AN$
380 IF AN$="y" OR AN$="Y" THEN N=N+1:S=1:GOTO 100
390 INPUT "DO YOU WANT TO SAVE YOUR DATA (Y/N)";A$
400 IF A$="Y" OR A$="y" THEN 610 ELSE END
410 REM -- 3 YEAR ACRS
420 IF Y=1 THEN R=.25
430 IF Y=2 THEN R=.38
440 IF Y=3 THEN R=.37
450 IF Y>3 THEN GOTO 150
460 RETURN
470 REM -- 5 YEAR ACRS
480 IF Y=1 THEN R=.15
490 IF Y=2 THEN R=.22
500 IF Y>2 AND Y<6 THEN R=.21
510 IF Y>5 THEN GOTO 150
520 RETURN
530 REM -- 10 YEAR ACRS
540 IF Y=1 THEN R=.08
550 IF Y=2 THEN R=.14
560 IF Y=3 THEN R=.12
570 IF Y>3 AND Y<7 THEN R=.1
580 IF Y>6 AND Y<11 THEN R=.09
590 IF Y>10 THEN GOTO 150
600 RETURN
610 REM -- DISK ACCESS
620 M=N
630 INPUT "WHAT WOULD YOU LIKE TO NAME YOUR FILE";F$
640 OPEN F$+".TAX" FOR OUTPUT AS #1
650 WRITE #1,M,NM$,SS$
660 FOR I=1 TO M
670 WRITE #1,IT$(I),BP(I),S$(I),B(I),C(I)
680 NEXT I
690 CLOSE #1
700 END
710 INPUT "WHAT FILE WOULD YOU LIKE TO READ";F$
720 OPEN F$+".TAX" FOR INPUT AS #1
730 INPUT#1,M,NM$,SS$
740 FOR I=1 TO M
750 INPUT #1,IT$(I),BP(I),S$(I),B(I),C(I)
760 NEXT I
770 CLOSE #1
780 CLS:PRINT"ITEMS IN THE FILE ARE "
790 FOR I=1 TO M
800 PRINT I,IT$(I)
810 NEXT I
820 INPUT "WHICH ITEM WOULD YOU NOW LIKE TO REVIEW (ENTER ITEM # OR 0 FOR
    NEW ITEM)";I
830 PRINT IT$(I):N=I:IF I=0 THEN N=M:GOTO 370
835 IF I<=M THEN GOTO 150
840 PRINT"THE ITEM YOU CHOOSE ISN'T IN THE FILE":FOR K=1 TO 1500:NEXT:
    GOTO 780
850 REM -- PRINTER SUBROUTINE
860 LPRINT C(N) "- YEAR DEPRECIATION (ACRS) WORKSHEET"
870 LPRINT NM$;"....................SS# ";SS$
880 LPRINT
890 LPRINT"COST RECOVERY FOR  ";IT$(N)
900 LPRINT
910 LPRINT "UNADJUSTED BASIS: ";:LPRINT USING "$$######.## ";BP(N)
920 LPRINT"DATE PLACED IN SERVICE: ";S$(N):LPRINT"DEPRECIATION YEAR: ";Y
930 LPRINT"RATE OF ACRS DEPRECIATION: ";100*R;"%"
940 DEP=BP(N)*R
950 LPRINT:LPRINT"FULL ACRS DEPRECIATION AMT.  =";:LPRINT USING
    "$$######.##";DEP
960 LPRINT"PERCENT OF USE FOR BUSINESS: ";B(N);"%":B=.01*B(N)
970 TD=B*DEP
980 LPRINT:LPRINT"ACRS DEPRECIATION DEDUCTION = ";:LPRINT USING
    "$$######.##";TD: LPRINT
990 GOTO 310
```

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At this moment, there are no less than 50 personal computers on the market. And more are being introduced every day.

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Computers come in two parts. You have to buy both.

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstration, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

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Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.

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Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A
HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

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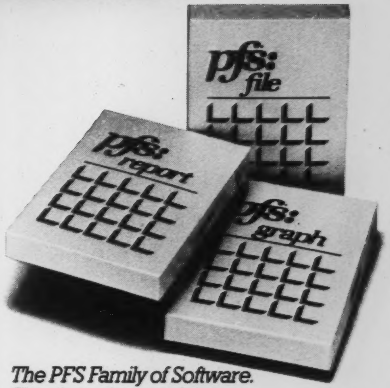

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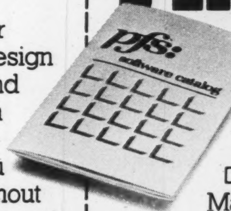

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CIRCLE 267 ON READER SERVICE CARD

Financial Analysis for the Apple II

Skene Moody

One of the primary uses for which I bought a microcomputer was to calculate the percentage rate of return on either actual or potential investments. I also wanted to be able to maintain modifiable disk records of the amounts and dates of such investments.

To satisfy these needs I needed a calendar-date-based database as well as a program which could perform Internal Rate of Return analysis on the data.

The Applesoft program Financial Analysis satisfies both objectives and does much more. The program is a menu-driven, user-oriented modular program with prompts. It offers a calendar-date-based modifiable financial database, and can READ/SAVE data from/to disk.

You can enter individual cash flows and have the computer generate a series of equal-amount flows by defining first and last dates, and the number of intervals (months, days, or years) between flows.

You can also modify dates or flows of individual data records, delete data by individual record number or dates, review all or part of the data on the screen, search for data record(s) by amount of cash flow, sort data by date, combine flows with same dates, and eliminate records with zero flows.

There is an efficient Newton routine to solve for Internal Rate of Return, and you can print a summary or detailed results (formatted) on an 80-column printer with page numbers and headers on each page.

The program also includes a short, transportable machine language routine which allows INPUT of strings with leading or imbedded commas, colons, or quotation marks and transportable subroutines which calculate the day number from a given month, day of month, and year (useful for calculating the number of days between dates) and the month, day, and year from the day number.

> ***One of the primary uses for which I bought a microcomputer was to calculate the percentage rate of return on either actual or potential investments.***

Also included is a formatting subroutine which allows you to specify dynamically the right-justified field width and the number of digits after the decimal. The routine inserts commas as appropriate to improve the appearance of the output.

Some applications for which I have used the program include calculating yields for common stocks considering both appreciation in per share price and dividends paid, calculating bond-yield-to-maturity, and calculating yields on Treasury bills.

I have also determined the yield (return) for my company stock purchase plan during the entire period I have participated and during the latest calendar year, calculated the true annual interest rate on my mortgage loan considering "points" and prepayment penalties, and found the true interest rate on my bank savings account and credit union share accounts.

Examples

Let's consider a very simple example: A $100 investment on January 1, 1981 and a return of $110 one year later. When you RUN the program, after a brief delay while the program initializes variables and POKEs the machine language routine, you will see a menu with 11 choices.

Choose option 2 (INPUT DATA FROM KEYBOARD OR DISK). and you will see the data entry sub-menu. Select option 2 of the sub-menu (INPUT SINGLE CASH FLOW DATA), and a data format window will be displayed on the screen.

Enter the following data:

```
1, 1, 81, -100
1, 1, 82, 110
```

Note that I use the convention that cash outflows are negative and inflows are positive. You may want to use the opposite convention—the only program constraint is that outflows have the opposite sign from inflows.

Skene H. Moody, 1754 St. Albans Rd., San Marino, CA 91108.

Next, type E to end single-flow data entry. Now type 4 (RETURN TO MAIN MENU), since you are finished with all data entry. Type 8 (CALCULATE INTERNAL RATE OF RETURN), and after the data are sorted (they are not needed in this case, but the program has no way of knowing this) answer the question DO YOU WANT TO ANALYZE (A)LL OR (S)OME OF THE DATA? with A.

Next, you will see the various interest rates the program tries while solving for the correct interest rate, and then the final result will again appear on the screen. These results include the first and last dates included in the analysis, the effective annual interest rate (10.007%), the sum of positive flows (110.00), the sum of negative flows (100.00), the sum of all stock flows (10.00), the daily interest rate (2.6115759E-04) and the number of iterations (4) the program needed to solve for the interest rate.

You are probably wondering why the interest rate determined by the program was 10.007% rather than the expected 10.000%. I have chosen this example to show the one approximation the program uses. The effective interest rate calculated by the program is for a 365.25-day year. This is the average number of days in a year and results in increasingly accurate interest rates as study durations increase.

In this particular case, since 1981 is not a leap year, the conventional answer can be calculated from the daily interest rate by the following formula:

```
((1 + 2.6115759E-4)↑ 365-1) x 100
   = 10.000%
```

This relationship is defined as FNA(X) in line 11080 of the program except that 365.25 is used instead of 365.

Yield on Common Stock

Let's look at an example which evaluates the yield on a common stock. Suppose the stock sold for $25.75 at the end of 1978 and paid a $0.62 dividend at the end of January, April, and July of 1979; a $0.68 dividend at the end of October, 1979 and also at the end of January, April, and July of 1980; and $0.74 at the end of October, 1980. Finally, assume the stock was quoted at $25.62 at the end of 1980.

The data to be entered are:

```
12, 31, 78, -25.75
 1, 31, 79,    .62
 4, 30, 79,    .62
 7, 31, 79,    .62
10, 30, 79,    .68
 1, 31, 80,    .68
 4, 30, 80,    .68
 7, 31, 80,    .68
10, 30, 80,    .74
12, 31, 80, 25.62
```

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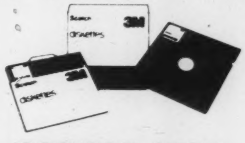

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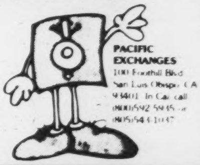

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When the results are calculated, we see that the effective rate of return is 10.637%. Although this is not a spectacular yield at today's high inflation rates, the example does point out that a positive return can be earned on a stock even though the sale price of the stock is lower than its purchase price and that dividends must be considered when calculating stock yields.

The example also reminds me to mention that the "Internal" in "Internal Rate of Return" implies that the method assumes no reinvestment of dividends or other cash returns. If the dividends had been reinvested, the owner would have more than one share of the stock to sell at the end of 1980, the $25.62 flow would be increased, and the analysis would result in a higher yield.

True Interest Rate

Finally, let's evaluate the true interest rate of a loan. Assume a lender agrees to lend you $6000 for three years at 17% interest on December 31, 1980 and tells you (correctly) that you will have monthly payments of $213.92 at the end of each month from January 31, 1981 through November 30, 1983 plus a final payment of $213.76 on December 31, 1983 (total of 36 payments).

To enter the data, use the INPUT SINGLE CASH FLOW DATA option (2) of the DATA ENTRY SUB-MENU to enter the initial (+) amount of the loan and the final (-) payment.

Use the INPUT SERIES OF CASH FLOW DATA option (3) of the submenu to enter the parameters needed for the program to generate the other (-) payments. If you REVIEW the data (main menu 5) you will note that the program automatically calculates the correct end dates of each month (28, 30, or 31 days).

After you return to the main menu and type 8 to branch to the CALCULATE INTERNAL RATE OF RETURN subroutine, the program will calculate the interest rate as 18.434%. This is very close to the theoretical answer which is obtained from the following calculation:

((1 + .17/12) ↑ 12-1.0) x 100 = 18.389%

The calculated interest rate is higher than the quoted interest rate of 17% since the loan is compounded monthly. The slight difference between the theoretical interest rate and the rate calculated by the program is because the program considers the actual number of days between payments and also because of the 365.25-day convention discussed earlier.

System Notes

The program was written for an Apple II Plus (Applesoft in ROM) system with 48K RAM and one disk drive. If all REMs are removed, line 12030 is replaced with RETURN, lines 12040 through 12270 are deleted and N in line 11030 is changed to 500, the program should run on a 32K system with a disk and Applesoft in ROM.

Printer Notes

The program was written to support a Microtek MT-80P 80-column printer interfaced with an Apple Centronics Parallel Interface Card in slot 1. The user may have to modify lines 5680 and 5720 to suit his particular printer.

Also, the CHR$(12) in lines 5590 and 5720 causes a form feed (top-of-form) to be executed on my printer. The CHR$(28) in lines 5490 and 5610 causes my printer to print wide (five characters/inch) letters and the CHR$(29) in lines 5490 and 5620 causes

Program Description

Line Numbers	Description
10-60	Remarks.
100-360	Displays Main Menu on the screen and asks for user to select option.
1000-1110	Data entry sub-menu.
1120-1240	Display data format window on screen.
1250-1440	Subroutine to input month, day, year, and cash flows.
1450-1490	Routine to enter single cash flows.
1500-1630	Subroutine to enter the required data for the program to generate a series of constant-amount cash flows.
1640-1670	Subroutine which generates a series of constant-amount cash flows which have an interval between flows which is a multiple of one day.
1680-1770	Subroutine which generates a series of cash flows which have an interval between flows which is a multiple of one month.
1780-1840	Subroutine which generates flows with an interval between flows which is a multiple of one year.
2000-2050	Subroutine which allows the user to modify individual date and flow records given the number of the record. The number of a record can be found by "Reviewing" the data (option 5 on the main menu).
3000-3100	Sub-menu to delete data.
3110-3160	Subroutine which asks user to enter the first and last (if more than one) record number to be deleted. If only one record is to be deleted the program displays the data and asks the user to confirm that the correct record was located.
3170	Deletes a range of records.
3180-3190	Search for the record to be deleted and if it is found, go to line 3200 where it is deleted.
3200	Does the actual deleting of one record.
3210-3240	Sort data by date if they are not already sorted and request inputs from the user to define the date(s) of data records which are to be deleted.
3250-3280	Delete all records within a range of dates.
3290-3330	Delete the single data record which contains the user-specified date and ask whether other single-date records are to be deleted.
3340-3410	Search for and display all data records which contain cash flows within one cent of a user-specified flow.
4000-4030	Applesoft speedup routine (see Credits).
4050-4080	Review routine—asks whether user wants to review all or some of the data and if the latter, asks user to input beginning and ending dates.
4090-4110	Print column headers and "window" the headers.
4120-4250	Display the range of data specified. Displayed data include record number, date, amount of flow, cumulative flow, and an asterisk (*) if there is a reversal in sign of the cumulative cash flow at the displayed flow.
4260	Applesoft speedup routine.
5000-5100	Determine whether all or some of the data are to be included when calculating Internal Rate of Return. If the latter, ask user to input the first and last dates to be included and find the appropriate beginning and ending record number.

my printer to output "normal" (10 characters/inch) letters.

Credits

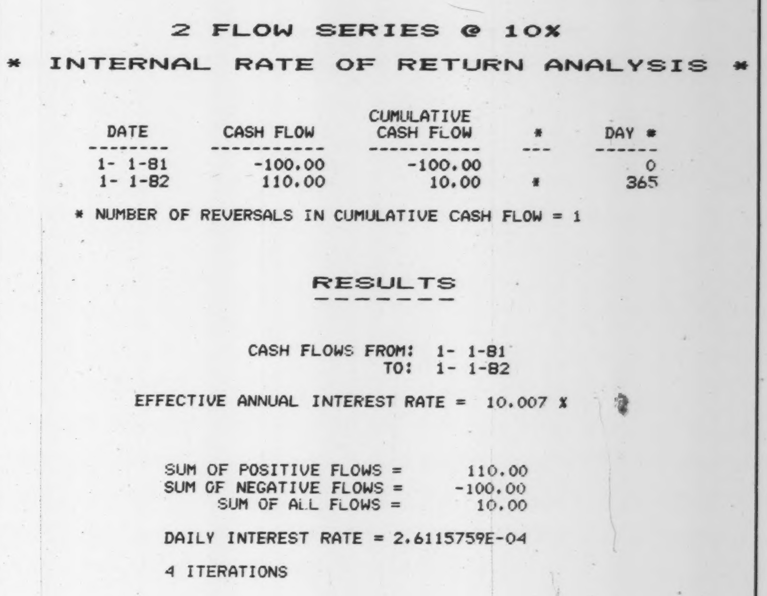
The Speeding in Applesoft routine which appears as part of lines 4030, 4240, 4260, 7060, 7220, and 11050 is from an article by Roger Wagner in the September 1979 issue of *Call-A.P.P.L.E.* Temporarily altering the "beginning" of an Applesoft program can reduce execution time since Applesoft searches for "destination" line numbers from GOTOs, IF . . . THENs, etc., from the "beginning" of the program.

Line 11050 places the pointers to the original beginning of the program into the variables P1 and P2. Lines 4030 and 7060 temporarily substitute the location of the current statement into the locations for the beginning of the program. Lines 4240, 4260, and 7220 restore the original program start addresses before the subroutine is exited.

The Input Anything routine which involves lines 1290, 3330, 5370, 9040, 10040, 11030, and 11110-11170 is from an article by Val J. Golding in the July-August, 1980 issue of *Call-A.P.P.L.E.*

The machine language routine in lines 11110-11170 uses the first defined string in an Applesoft program (in this case IN$) as a temporary buffer. The routine allows the user to input strings containing leading or imbedded commas, colons, or quotation marks. Syntax is as follows: CALL 768:A$ = MID$(IN$, 1). A$ is the variable in which the string is to be INPUT.

Printer output of the first example described in the article.



```
                 2 FLOW  SERIES  @  10%
*  INTERNAL  RATE  OF  RETURN  ANALYSIS  *

                                CUMULATIVE
     DATE       CASH FLOW       CASH FLOW      *       DAY *
   --------    -----------     -----------    ---     ------
   1- 1-81        -100.00         -100.00                  0
   1- 1-82         110.00           10.00      *         365

  * NUMBER OF REVERSALS IN CUMULATIVE CASH FLOW = 1


                          RESULTS
                          -------


                  CASH FLOWS FROM:  1- 1-81
                              TO:  1- 1-82

          EFFECTIVE ANNUAL INTEREST RATE =  10.007 %


             SUM OF POSITIVE FLOWS =      110.00
             SUM OF NEGATIVE FLOWS =     -100.00
                  SUM OF ALL FLOWS =       10.00

             DAILY INTEREST RATE = 2.6115759E-04

             4 ITERATIONS
```

Note:

$[(1 + 2.6115759\ E\text{–}4)^{365.25} - 1]*100 = 10.007\%$ as shown. In this particular case, since 1981 is not a leap year, the expected result for 365-day year could be calculated as $[(1+2.6115759\ E\text{–}4)^{365} - 1]*100 = 10.000\%$

5110-5140	Main calculation routine. This iterative routine uses Newton's method to determine the amount of change (DI) to make to the last-tried interest rate (IR) to obtain the next trial interest rate. Note that if there is more than one reversal in the sign of the cumulative cash flows (sorted data), more than one interest rate is mathematically correct. While this program may find one of the solutions, it is not able to find or indicate other possibilities.
5150-5260	Print results on screen. Ask whether user desires results to be printed on printer.
5270-5290	If printer results are requested, ask whether Summary (same as screen) or Detailed (also prints all dates and flows) Results are desired.
5300-5330	Print summary results on printer.
5340-5580	Print detailed results on printer after asking user to enter the (maximum of 40 character) title which will be printed at the top of each page.
5590	Prints page number at top of each page after the first.
5600-5620	Print title at top of each page.
5630-5640	Print column headers at top of page.
5650-5680	Turn printer on (see Printer Notes).
5690-5720	Turn printer off.
6000-6130	Format routine. The routine is entered with the number to be formatted (XX), the width of the right-justified field (W%), and the number of digits after the decimal (X%). The routine zero-fills after the decimal if needed, adds commas as appropriate, and outputs the resultant string (A$). If the number is too large for the field, asterisks are printed.
7000-7130	Sort routine. The routine uses the insertion sort which is generally regarded as slow. However, it is the fastest routine for data which is in near-sorted form. Since I generally enter data in date-order or add only a few items to a previously sorted array, this method was selected. Line 7060 is part of the Applesoft speedup routine. Lines 7070 and 7080 place the day number relative to the date of the first data record into D% (I,0 to use as the sort key. This is done since the day number is a six-digit number and an integer variable can only hold values as large as 32,767 (approximately 89.7 years). Thus, a program limitation is that all dates must be no more than 89.7 years away from the date of the first data record.
7140-7250	Combine flows with same dates and eliminate records with zero flows.

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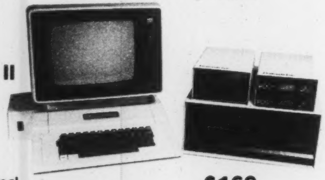

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Financial Analysis, continued...

Detailed Printer Output of the second example described in the article.

```
        XYZ STOCK, 12-31-78 TO 12-31-80

    * INTERNAL RATE OF RETURN ANALYSIS *

                                CUMULATIVE
         DATE      CASH FLOW     CASH FLOW    *      DAY *
       ---------  -----------  -----------   ---   ------
       12-31-78      -25.75       -25.75                0
        1-31-79        0.62       -25.13               31
        4-30-79        0.62       -24.51              120
        7-31-79        0.62       -23.89              212
       10-31-79        0.68       -23.21              304
        1-31-80        0.68       -22.53              396
        4-30-80        0.68       -21.85              486
        7-31-80        0.68       -21.17              578
       10-31-80        0.74       -20.43              670
       12-31-80       25.62         5.19      *       731

      * NUMBER OF REVERSALS IN CUMULATIVE CASH FLOW = 1


                          RESULTS
                          -------


                   CASH FLOWS FROM: 12-31-78
                                TO: 12-31-80

         EFFECTIVE ANNUAL INTEREST RATE =  10.637 %



            SUM OF POSITIVE FLOWS =        30.94
            SUM OF NEGATIVE FLOWS =       -25.75
                 SUM OF ALL FLOWS =         5.19

            DAILY INTEREST RATE = 2.76784179E-04

            5 ITERATIONS
```

Data for third example described in the article.

```
37
12,31,80,6000
 1,31,81,-213.92
 2,28,81,-213.92
 3,31,81,-213.92
 4,30,81,-213.92
 5,31,81,-213.92
 6,30,81,-213.92
 7,31,81,-213.92
 8,31,81,-213.92
 9,30,81,-213.92
10,31,81,-213.92
11,30,81,-213.92
12,31,81,-213.92
 1,31,82,-213.92
 2,28,82,-213.92
 3,31,82,-213.92
 4,30,82,-213.92
 5,31,82,-213.92
 6,30,82,-213.92
 7,31,82,-213.92
 8,31,82,-213.92
 9,30,82,-213.92
10,31,82,-213.92
11,30,82,-213.92
12,31,82,-213.92
 1,31,83,-213.92
 2,28,83,-213.92
 3,31,83,-213.92
 4,30,83,-213.92
 5,31,83,-213.92
 6,30,83,-213.92
 7,31,83,-213.92
 8,31,83,-213.92
 9,30,83,-213.92
10,31,83,-213.92
11,30,83,-213.92
12,31,83,-213.76
```

8000-8040	Calculate six-digit day number from month, day-of-month, and last two digits of year. To minimize the amount of keyboard data entry I decided to write the program to require entry of only the last two digits of the year. Naturally, this limits the range of dates which the program can handle to a span of 100 years. Limitations in the largest number which can be held in an integer variable effectively reduce this range to less than 90 years. The 45 in line 8030 positions the partition—the number 45 will be interpreted as 1945 and the number 44 will be interpreted as 2044.
8200-8300	Calculate month, day-of-month, and last two digits of year from six-digit day number.
9000-9100	Read data from disk. Note that data from several data files can reside in the program simultaneously.
10000-10100	Save data to disk.
11000-11090	Initialize variables. IN$ must be the first string variable defined in the program—it is used as a temporary buffer for the Input Anything Routine. N in line 11030 dimensions the date and flow arrays and can be modified to suit individual system requirements. Each 100 change in N changes RAM requriements by 1500 bytes.
11100-11180	Machine language routine to implement the Input Anything Routine.
12000-12270	Brief program description.

Variables

A	Numeric variable used for INPUT statements.
A$	String variable used for INPUT statements. Also used as the output string in the Format (6000 series) subroutine.
A1	Numerical input variable containing the number of periods between equal-value flows in the Data Entry (1000 series) subroutine.
A1$	String input variable used in the Review Data (4000 series) subroutine. Also holds the title which is printed on each page of the detailed printer output (5000 series).
A1$(I)	Holds the words DAYS, MONTHS, or YEARS for I=1 to 3 respectively which are used in the prompt in line 1600.
AS$	Holds either blanks or blanks plus an asterisk (*) as appropriate to indicate a reversal in the sign of the cumulative cash flows.
B%	Temporary variable used in the Format subroutine.
C and C$	Temporary variables used in Format subroutine.
C1 and C2	Hold either cumulative sum of cash flows, present value of cash flows, or sum of positive and negative cash flows as appropriated in the Review Data (4000 series) or Calculate Results (5000 series) subroutines.

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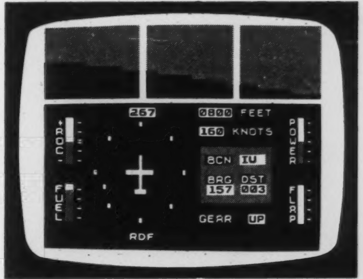

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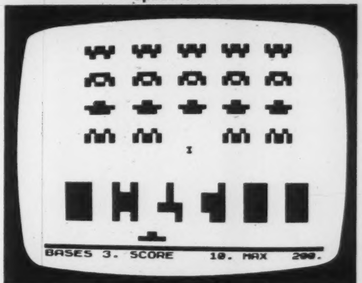
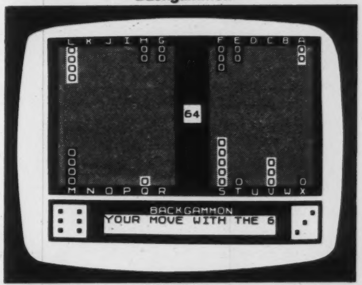
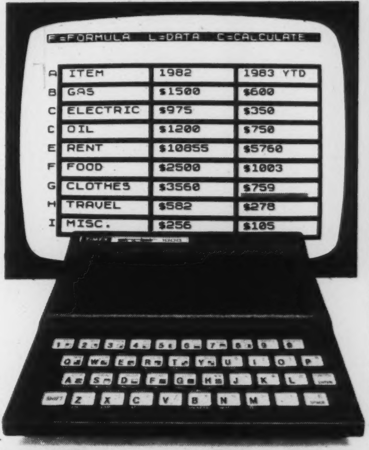


Backgammon



VU-CALC



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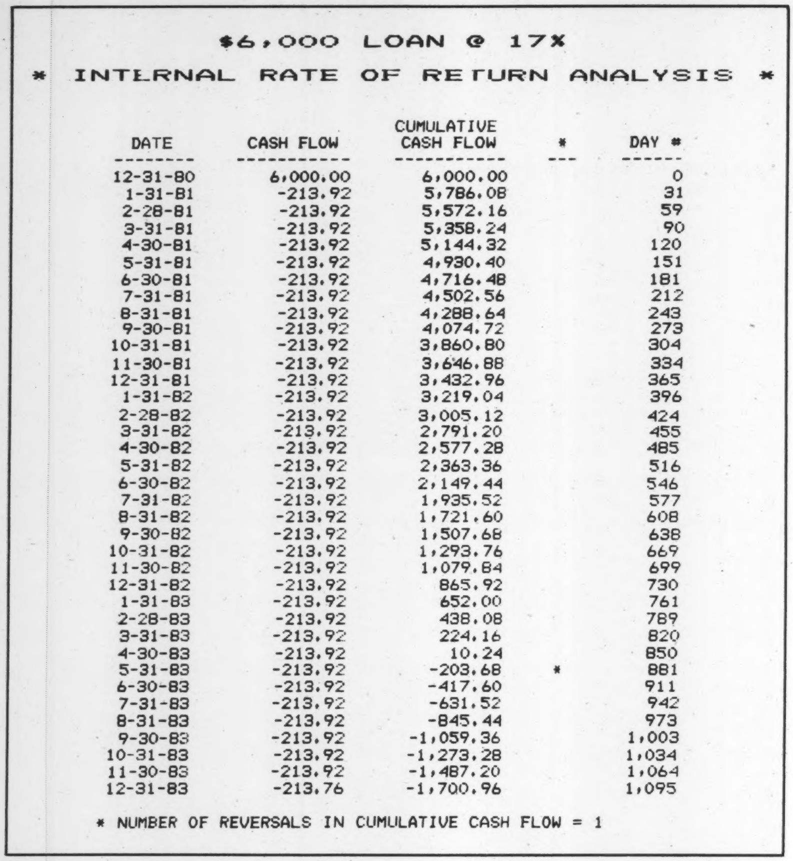

```
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 *  INTERNAL RATE OF RETURN ANALYSIS  *

                                CUMULATIVE
     DATE        CASH FLOW      CASH FLOW      *       DAY #
   --------     -----------    -----------    ---     ------
   12-31-80       6,000.00       6,000.00                  0
    1-31-81        -213.92       5,786.08                 31
    2-28-81        -213.92       5,572.16                 59
    3-31-81        -213.92       5,358.24                 90
    4-30-81        -213.92       5,144.32                120
    5-31-81        -213.92       4,930.40                151
    6-30-81        -213.92       4,716.48                181
    7-31-81        -213.92       4,502.56                212
    8-31-81        -213.92       4,288.64                243
    9-30-81        -213.92       4,074.72                273
   10-31-81        -213.92       3,860.80                304
   11-30-81        -213.92       3,646.88                334
   12-31-81        -213.92       3,432.96                365
    1-31-82        -213.92       3,219.04                396
    2-28-82        -213.92       3,005.12                424
    3-31-82        -213.92       2,791.20                455
    4-30-82        -213.92       2,577.28                485
    5-31-82        -213.92       2,363.36                516
    6-30-82        -213.92       2,149.44                546
    7-31-82        -213.92       1,935.52                577
    8-31-82        -213.92       1,721.60                608
    9-30-82        -213.92       1,507.68                638
   10-31-82        -213.92       1,293.76                669
   11-30-82        -213.92       1,079.84                699
   12-31-82        -213.92         865.92                730
    1-31-83        -213.92         652.00                761
    2-28-83        -213.92         438.08                789
    3-31-83        -213.92         224.16                820
    4-30-83        -213.92          10.24                850
    5-31-83        -213.92        -203.68      *         881
    6-30-83        -213.92        -417.60                911
    7-31-83        -213.92        -631.52                942
    8-31-83        -213.92        -845.44                973
    9-30-83        -213.92      -1,059.36              1,003
   10-31-83        -213.92      -1,273.28              1,034
   11-30-83        -213.92      -1,487.20              1,064
   12-31-83        -213.76      -1,700.96              1,095

   * NUMBER OF REVERSALS IN CUMULATIVE CASH FLOW = 1
```

"Detailed" printer output of the third example.

D	Temporary variable holding the day of the month in the Data Entry subroutine between lines 1540 and 1820.
D$	Apple Disk Operating System (DOS) deferred-execution control character. Defined as RETURN + CTRL-D in line 11040.
D%(I,J)	Date array, I=record number (1 to NS). J can have values from 0 to 3: D%(I,0) holds the day number relative to the day number of the first data record. D%(I,1) holds the month (1 to 12); D%(I,2) holds the day of the month; and D%(I,3) holds the last two digits of the year (e.g., 80 for 1980).
D1	Holds either a six-digit day number designating the first date in a range of dates or the first record number in a range of record numbers. These ranges appear in Data Entry (1000 series), Modify (2000 series), Delete (3000 series), Review (4000 series), and Calcuate Results (5000 series).
D2	Holds the last date or record number in a range of dates (see D1).
D3 and D4	Temporary first and last dates used in Calculate Results (5000 series) subroutine.
DE	Flag used in the Data Input subroutine (lines 1260-1440) to indicate (if DE=1) that the routine was entered from the Delete subroutine.
DI	Contains the value by which the last daily interest rate (IR) should be changed to obtain the next interest rate when solving for Internal Rate of Return (lines 5110 to 5140).
DK	Used in lines 9100 and 10030 to indicate (if DK=1) that data have been read from the disk.
DN	Contains the six-digit day number calculated in lines 8030 and 8040 from the month, day-of-month, and year.
DX	Six-digit day number calculated in line 7070 from the date of the first data record.
F	Temporary variable holding the cash flow to be used when generating a series of flows in lines 1540, 1670, 1710, and 1810. Also used to hold the cash flow being searched for in line 3400.
FL(I)	Contains the individual cash flows for each data record.
I	General subscript and loop variable. Note, however, that the subscript I must be used to enter the subroutine which calculates the day number from the month, day-of-month, and year in lines 8030 and 8040.
IN$	General string input variable used by the Input Anything Routine (see Credits).

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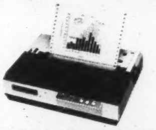

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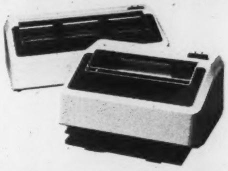

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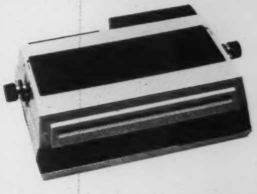

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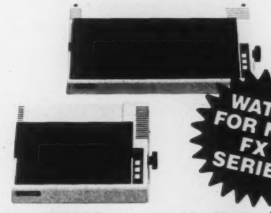

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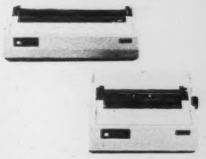

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```
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     * INTERNAL RATE OF RETURN ANALYSIS *


                      RESULTS
                      -------

               CASH FLOWS FROM: 12-31-80
                            TO: 12-31-83

        EFFECTIVE ANNUAL INTEREST RATE =  18.434 %


          SUM OF POSITIVE FLOWS =    6,000.00
          SUM OF NEGATIVE FLOWS =   -7,700.96
               SUM OF ALL FLOWS =   -1,700.96

          DAILY INTEREST RATE = 4.63313393E-04

          4 ITERATIONS
```

$$[(1 + {.17}/{12})^{12} - 1] * 100 = 18.389\%$$

"Detailed" printer output of the third example, continued.

IR	Latest estimate of the daily interest rate in the Calculate Financial Results subroutine (5000 series).
J	Temporary subscript or loop index.
K	Temporary subscript.
K$	Temporary input string in line 4250.
K1	36525 (100 * Average number of days in a year).
K2	365.25 (Average number of days in a year).
K3	367 (used in calculating the month, day and year from a given day number—lines 8230 to 8300).
K4	4 (used in calculating the day number from a given month, day, and year in line 8040).
K5	9 (used in line 8040).
K6	12 (used in lines 8040 and 8260).
K7	7 (used in line 8040).
K8	27 (used in line 8040).
K9	122.1 (used in line 8230).
L1	30.6001 (used in lines 8230 and 8240).
L2	1900 (used in lines 8030 and 8270).
L3	Temporary variable (lines 8030 and 8040).
LN	Line number of screen or printer output.
M	Temporary variable. Contains the number of the month (1-12).
M1	Temporary variable used in line 1710.
MX	Maximum number of iterations (line 5110) allowed to calculate the Internal Rate of Return.
N	Temporary variable.
NR	Number of active records.
NS	Total number of data records, active + inactive.
NX	Temporary, 9000 series.
P1 and P2	Low and high bytes of the pointer to the original beginning of the program. Used in Applesoft speedup routine.
P3	Temporary beginning of program used in lines 4030 and 7060 as part of the Applesoft speedup routine.
PG	Page number. Used when printing detailed output to the printer.
Q$	Temporary input string (line 3310).
R%(I)	Integer array which contains the sorted or unsorted (before sort routine is called) order of the data records. For example if R%(9) contains the value 3, this means that the ninth-in-order record is record number 3.
RV	Reversal counter. Counts the number of reversals in sign of the cumulative cash flow.
SR	Sort flag. If SR=1 then the data is in date-sorted order.
T$	Contains the name of the last-read disk data file.
TB	Tab value for print statements. TB=0 (line 5150) for screen results and TB=20 (line 5330) for summary results on printer.
TE	Temporary subscript.
TL	Tolerance for change in daily interest rate. If the calculated change in interest rate (DI) is less than TL, then the Internal Rate of Return is considered to have been solved to sufficient accuracy.
TM	Temporary subscript
W%	Width of output field in Format (6000 series) subroutine.
X	Temporary variable in 5000 series of line numbers. Dummy variable in defining FNA(*x*) (line 11080).
X%	Number of places after the decimal point in Format (6000 series) subroutine.
XX	Variable used to hold the number to be formatted in the Format (6000) series) subroutine.
Y and YY	Temporary storage of the number of the year, Y holds the last two digits only; YY holds the four-digit value.

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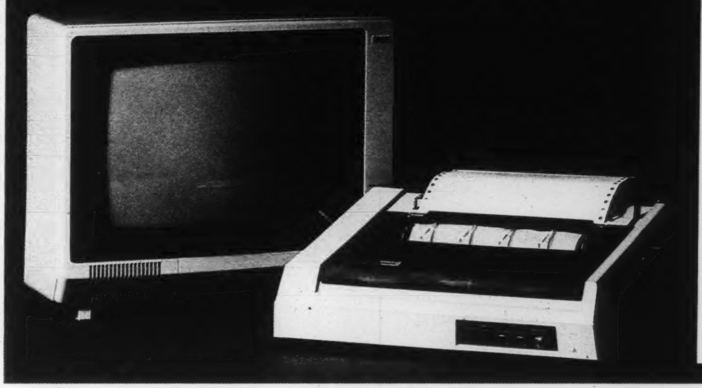

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```
10  REM ************************
20  REM *  FINANCIAL ANALYSIS   *
30  REM *    BY S.H. MOODY      *
40  REM *     VERSION 1.1       *
50  REM *       2-12-81         *
60  REM ************************
100  REM
110  REM ** MAIN PROGRAM **
120  REM
130  REM * MAIN MENU *
140  REM
150  CLEAR : GOSUB 11030
160  TEXT : HOME
170  PRINT : PRINT : PRINT  TAB( 2)"FINANCIAL ANALYSIS/DATABASE PROGRAM"
180  PRINT  TAB( 15)"MAIN MENU"
190  PRINT  TAB( 4)"(";NR;" ACTIVE & ";NS;" TOTAL RECORDS)"
200  PRINT  TAB( 12); FRE (0);" BYTES FREE"
210  PRINT : PRINT "  (1) PROGRAM DESCRIPTION"
220  PRINT "  (2) INPUT DATA FROM KEYBOARD OR DISK"
230  PRINT "  (3) MODIFY DATA"
240  PRINT "  (4) DELETE DATA"
250  PRINT "  (5) REVIEW DATA"
260  PRINT "  (6) SEARCH FOR CASH FLOW"
270  PRINT "  (7) SORT BY DATE AND ADD FLOWS WITH          SAME DATES"
280  PRINT "  (8) CALCULATE INTERNAL RATE OF RETURN       (YIELD) ON INVES
     TMEMT"
290  PRINT "  (9) SAVE DATA (PRESENT ORDER) TO DISK"
300  PRINT " (10) BEGIN NEW ANALYSIS
310  PRINT " (11) END
320  PRINT : INPUT "WHICH NUMBER ? ";A
330  ON A GOSUB 12030,1050,2030,3030,4030,3370,7060,5030,10030,150,360
340  GOTO 160
360  END
1000  REM
1010  REM ** ADD DATA FROM KEYBOARD OR DISK **
1020  REM
1030  REM  ** DATA ENTRY SUB-MENU **
1040  REM
1050  HOME : PRINT : PRINT  TAB( 10)"DATA ENTRY SUB-MENU": PRINT
1060  PRINT "  (1) READ DATA FROM DISK"
1070  PRINT "  (2) INPUT SINGLE CASH FLOW DATA"
1080  PRINT "  (3) INPUT SERIES OF CASH FLOW DATA"
1090  PRINT "  (4) RETURN TO MAIN MENU
1100  PRINT : PRINT : INPUT "  WHAT IS YOUR CHOICE ? ";A: IF A >  = 4 THEN
       TEXT : RETURN
1110  ON A GOSUB 9030,1480,1530: TEXT : GOTO 1050
1120  REM
1130  REM ** PRINT DATA FORMAT WINDOW **
1140  REM
1150  HOME : PRINT : PRINT  TAB( 5)"THE FORMAT FOR DATA INPUT IS:"
1160  PRINT
1170  PRINT  TAB( 5)"MM, DD, YY, FLOW": PRINT
1180  PRINT  TAB( 5)"WHERE MM = MONTH (1-12)
1190  PRINT  TAB( 11)"DD = DAY OF MONTH (1-31)
1200  PRINT  TAB( 11)"YY = YEAR (LAST 2 DIGITS)"
1210  PRINT  TAB( 16)"(YEAR 2000 = '00', ETC.)"
1220  PRINT  TAB( 9)"FLOW = CASH INCOME (+) OR": PRINT  TAB( 16)"OUTFLOW (
     -)"
1230  PRINT  TAB( 5)"ENTER (E)ND TO STOP DATA ENTRY"
1240  FOR I = 1 TO 40: PRINT "-";: NEXT : POKE 34, PEEK (37): RETURN
1250  REM
1260  REM   ** INPUT MM,DD,YY,$FLOW SUBROUTINE **
1270  REM
1280 NR = NR + 1:NS = NS + 1:DE = 0
1290  PRINT "RECORD * ";NS;": ";: CALL 768:A$ =  MID$ (IN$,1)
1300  IF  LEFT$ (A$,1) = "E" THEN NR = NR - 1:NS = NS - 1: POP : TEXT : RE
     TURN
1310 D%(NS,1) =  VAL (A$)
1320  IF D%(NS,1) < 1 OR D%(NS,1) > 12 THEN  PRINT  CHR$ (7): PRINT "THERE
      ARE NO MONTHS NUMBERED ";D%(NS,1);".": PRINT "REENTER THE RECORD.":
     GOTO 1290
1330  FOR I = 1 TO  LEN (A$): IF  MID$ (A$,I,1) = "," THEN N = I: GOTO 135
     0
1340  NEXT
1350 D%(NS,2) =  VAL ( MID$ (A$,N + 1))
1360  IF D%(NS,2) < 1 OR D%(NS,2) > 31 THEN  PRINT  CHR$ (7): PRINT "THERE
      ARE NO ";D%(NS,2);" DAY MONTHS.": PRINT "REENTER THE RECORD.": GOTO
      1290
1370  FOR I = N + 1 TO  LEN (A$): IF  MID$ (A$,I,1) = "," THEN N = I: GOTO
      1390
1380  NEXT
1390 D%(NS,3) =  VAL ( MID$ (A$,N + 1)): IF DE THEN  RETURN
1400  FOR I = N + 1 TO  LEN (A$): IF  MID$ (A$,I,1) = "," THEN FL(NS) =  V
     AL ( MID$ (A$,I + 1))
1410  NEXT
1420  IF FL(NS) = 0 THEN  PRINT  CHR$ (7): PRINT "FLOW = 0.0 SO RECORD IGN
     ORED.": GOTO 1290
1430 R%(NR) = NS
1440 SR = 0: RETURN
1450  REM
1460  REM  ** ENTER SINGLE CASH FLOWS **
1470  REM
1480  GOSUB 1150
1490  GOSUB 1280: GOTO 1490
1500  REM
1510  REM ** ENTER SERIES OF FLOWS **
1520  REM
1530  HOME : GOSUB 1150: PRINT : PRINT "ENTER THE DATA FOR THE FIRST FLOW
      OF THESERIES: "
1540  GOSUB 1280:I = NS:M = D%(I,1):D = D%(I,2):Y = D%(I,3):F = FL(I): GOS
     UB 8030:D1 = DN
```

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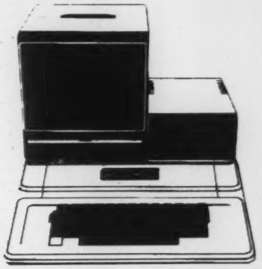

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CIRCLE 141 ON READER SERVICE CARD

```
1550  PRINT "IS THE TIME INTERVAL A MULTIPLE OF:"
1560  PRINT  TAB( 5)"(1) DAYS"
1570  PRINT  TAB( 5)"(2) MONTHS"
1580  PRINT  TAB( 5)"(3) YEARS"
1590  INPUT "WHICH ? ";A
1600  PRINT "HOW MANY ";A1$(A);: INPUT " BETWEEN FLOWS ? ";A1
1610 I = NS + 1: INPUT "DATE SERIES ENDS (M,D,Y) ? ";D%(I,1),D%(I,2),D%(I,
    3)
1620  GOSUB 8030:D2 = DN
1630  ON A GOSUB 1670,1710,1810: RETURN
1640  REM
1650  REM * BASE = DAY(S) *
1660  REM
1670  FOR DN = D1 + A1 TO D2 STEP A1:NR = NR + 1:NS = NS + 1:I = NS: GOSUB
     8230:R%(I) = NR:FL(I) = F: NEXT : RETURN
1680  REM
1690  REM * BASE = MONTH(S) *
1700  REM
1710 M = M + A1:M1 =  INT ((M - 1) / 12):M = M - M1 * 12:I = NS + 1:D%(I,1
    ) = M:D%(I,2) = D:D%(I,3) = D%(NS,3) + M1:R%(I) = NR + 1:FL(I) = F
1720  IF D > 29 AND M = 2 AND  INT (D%(I,3) / 4) * 4 = D%(I,3) THEN D%(I,2
    ) = 29: GOTO 1740
1730  IF D > 28 AND M = 2 THEN D%(I,2) = 28
1740  IF D > 30 AND (M = 4 OR M = 6 OR M = 9 OR M = 11) THEN D%(I,2) = 30
1750  GOSUB 8030: IF DN > D2 THEN  RETURN
1760  IF D%(I,3) > 99 THEN D%(I,3) = D%(I,3) - 100
1770 NR = NR + 1:NS = NS + 1: GOTO 1710
1780  REM
1790  REM * BASE = YEAR(S) *
1800  REM
1810 Y = Y + A1:I = NS + 1:D%(I,1) = M:D%(I,2) = D:D%(I,3) = Y:R%(I) = NR
    + 1:FL(I) = F: IF Y > 99 THEN D%(I,3) = Y - 100
1820  IF D > 28 AND M = 2 AND  INT (D%(I,3) / 4) * 4 <  > D%(I,3) THEN D%(
    I,2) = 28
1830  GOSUB 8030: IF DN > D2 THEN  RETURN
1840 NR = NR + 1:NS = NS + 1: GOTO 1810
2000  REM
2010  REM ** MODIFY DATA **
2020  REM
2030  HOME : VTAB 5: INPUT "ENTER RECORD NUMBER YOU WANT MODIFIED   (ENTER
     'E' TO END): ";A$: IF A$ = "E" THEN SR = 0: RETURN
2040 D1 =  VAL (A$): PRINT : PRINT " ";D%(D1,1);", ";D%(D1,2);", ";D%(D1,3
    );",   ";FL(D1);: INPUT "  THIS ONE (Y/N) ? ";A$: IF A$ <  > "Y" THEN
     2030
2050  INPUT "ENTER NEW MM, DD, YY, FLOW:                 ";D%(D1,1),D%(D1,2),D
    %(D1,3),FL(D1): GOTO 2030
3000  REM
3010  REM ** DELETE DATA **
3020  REM
3030  HOME : PRINT : PRINT " TO DELETE A SERIES OF FLOWS, ENTER A   NEW SE
    RIES OF FLOWS WITH THE ORIGINAL   DATES AND WITH A CASH FLOW OF EQUAL
          MAGNITUDE BUT OPPOSITE SIGN."
3040  PRINT : PRINT "DO YOU WANT TO:"
3050  PRINT : PRINT "   (1) DELETE CASH FLOWS BY RECORD            NUMBER
     OR RANGE OF RECORD NUMBERS        (SHOWN IN 'REVIEW' ROUTINE)"
3060  PRINT "   (2) DELETE RECORDS BY DATE OR RANGE          OF DATES"
3070  PRINT "   (3) RETURN TO MAIN MENU"
3080  PRINT : INPUT "WHICH ? ";A
3090  IF A < 1 OR A > 2 THEN  RETURN
3100  ON A GOTO 3110,3210
3110  HOME : VTAB 5: INPUT " ENTER FIRST RECORD NUMBER TO BE         DELETE
    D: ";D1
3120  PRINT : INPUT " ENTER LAST RECORD TO BE DELETED (PRESS RETURN IF ONL
    Y ONE RECORD): ";A$
3130 D2 =  VAL (A$): IF D2 <  > 0 THEN 3170
3140  PRINT : PRINT D%(D1,1);"-";D%(D1,2);"-";D%(D1,3);"  ";FL(D1);: INPUT
     "   THIS ONE (Y/N) ? ";A$: IF A$ = "Y" THEN  GOSUB 3180
3150  PRINT : INPUT "ENTER RECORD TO DELETE ('E' TO END): ";A$: IF A$ <  >
     "E" THEN D1 =  VAL (A$): GOTO 3140
3160  GOTO 3030
3170  FOR D1 = D1 TO D2: GOSUB 3180: NEXT : RETURN
3180  FOR I = 1 TO NR: IF R%(I) = D1 THEN 3200
3190  NEXT : PRINT "RECORD # ";D1;" DIDN'T EXIST": RETURN
3200 NR = NR - 1: FOR J = I TO NR:R%(J) = R%(J + 1): NEXT : RETURN
3210  IF  NOT SR THEN  HOME : VTAB 5: PRINT "PLEASE WAIT WHILE I SORT THE
    DATA.": GOSUB 7060
3220 I = NS + 1: INPUT "ENTER BEGINNING MM,DD,YY: ";D%(I,1),D%(I,2),D%(I,3
    ): GOSUB 8030:D1 = DN - DX
3230  INPUT "(S)INGLE DELETION OR (R)ANGE ?";A$: IF A$ = "S" THEN 3290
3240  INPUT "ENTER LAST MM,DD,YY: ";D%(I,1),D%(I,2),D%(I,3): GOSUB 8030:D2
     = DN - DX
3250 N = 1
3260  FOR I = N TO NR:TE = R%(I): IF D%(TE,0) < D1 OR D%(TE,0) > D2 THEN 3
    280
3270  GOSUB 3200:N = I: GOTO 3260
3280  NEXT : GOTO 3030
3290  FOR I = 1 TO NR:TE = R%(I): IF D%(TE,0) = D1 THEN 3310
3300  NEXT : PRINT "RECORD NOT FOUND": GOTO 3330
3310  PRINT D%(TE,1);"-";D%(TE,2);"-";D%(TE,3);"  ";FL(TE);: INPUT "  THIS
     ONE (Y/N) ? ";Q$: IF Q$ <  > "Y" THEN 3330
3320  GOSUB 3200
3330  PRINT "ENTER DATE TO DELETE ('E' TO END): ";:DE = 1:NR = NR + 1:NS =
     NS + 1: CALL 768:A$ =  MID$ (IN$,1): GOSUB 1300:I = NR: GOSUB 8030:D
    1 = DN - DX:NR = NR - 1:NS = NS - 1: GOTO 3290
3340  REM
3350  REM  ** SEARCH **
3360  REM
3370  HOME : PRINT " USE 'REVIEW' OPTION TO FIND A RECORD   GIVEN THE DATE
    ."
3380  PRINT : PRINT  TAB( 1)"RECORD"; TAB( 9)"DATE"; TAB( 21)"FLOW": PRINT
      TAB( 1)"------"; TAB( 8)"--------"; TAB( 19)"---------": POKE 34, P
    EEK (37)
3390  PRINT : INPUT " ENTER THE FLOW TO SEARCH FOR (ENTER 'E'TO END): ";A$
    : IF A$ = "E" THEN  TEXT : RETURN
3400  HOME :F =  VAL (A$): FOR I = 1 TO NR:TE = R%(I): IF FL(TE) < F + .01
     AND FL(TE) > F - .01 THEN  PRINT  TAB( 2)TE; TAB( 8)D%(TE,1);"-";D%(
    TE,2);"-";D%(TE,3); TAB( 19)FL(TE)
3410  NEXT : GOTO 3390
4000  REM
4010  REM ** REVIEW DATA **
4020  REM
4030 P3 =  PEEK (121) + 256 *  PEEK (122) + 1: POKE 103,P3 -  INT (P3 / 25
    6) * 256: POKE 104,P3 / 256
4050  HOME : VTAB 5: INPUT "REVIEW (A)LL DATA OR (S)OME ? ";A1$
4060  IF A1$ <  > "S" THEN 4090
4070 I = NS + 1: INPUT "ENTER BEGINNING MM,DD,YY: ";D%(1,1),D%(I,2),D%(I,3
    ): GOSUB 8030:D1 = DN
4080  INPUT "ENTER LAST MM,DD,YY: ";D%(I,1),D%(I,2),D%(I,3): GOSUB 8030:D2
     = DN
4090  HOME : PRINT : PRINT "REC   DATE       FLOW       CUM. FLOW  RV"
4100  PRINT "--- -------- ---------- ---------- --"
4110  POKE 34, PEEK (37)
4120 C1 = 0:C2 = 0:AS$ = "":LN = 0:N = 0:RV = 0
4130  FOR J = 1 TO NR:I = R%(J): IF A1$ <  > "S" THEN 4140
4135  GOSUB 8030: IF DN < D1 OR DN > D2 THEN 4230
4140 C1 = C1 + FL(I):N = N + 1: IF  SGN (C1) <  >  SGN (C2) AND N > 1 THEN
     AS$ = "  *":RV = RV + 1
4150 XX = I:W% = 3:X% = 0: GOSUB 6030
4160 XX = D%(I,1): GOSUB 6030
4170  PRINT "-";:XX = D%(I,2):W% = 2: GOSUB 6030
4180  PRINT "-";:XX = D%(I,3): GOSUB 6030
4190 XX = FL(I):W% = 12:X% = 2: GOSUB 6030
4200 XX = C1: GOSUB 6030
4210  PRINT AS$
4220 C2 = C1:AS$ = "":LN = LN + 1: IF LN = 19 THEN LN = 0: GOSUB 4250
```

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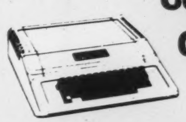

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CIRCLE 200 ON READER SERVICE CARD

```
4230  NEXT : IF RV > 1 AND SR THEN  PRINT : PRINT "THERE ARE ";RV;" REVERS
     ALS IN THE CUMUL. CASHFLOWS--THERE MAY BE MULTIPLE RATES OF   RETURN.
       IRR ANALYSIS IS UNRELIABLE."
4240  GOSUB 4250: TEXT : POKE 103,P1: POKE 104,P2: RETURN
4250  PRINT : PRINT "HIT 'SPACE' TO CONTINUE, 'ESC' FOR MENU";: GET K$: PR
     INT K$: IF  ASC (K$) <  > 27 THEN  RETURN
4260  POP : POKE 103,P1: POKE 104,P2: RETURN
5000  REM
5010  REM ** CALCULATE FINANCIAL RESULTS **
5020  REM
5030  IF  NOT SR THEN  HOME : PRINT : PRINT "PLEASE WAIT WHILE I SORT THE
     DATA": GOSUB 7060
5040 D1 = NR:D2 = 1: HOME : PRINT : INPUT "DO YOU WANT TO ANALYZE (A)LL OR
      (S)OME  OF THE DATA ? ";A$: IF A$ <  > "S" THEN D1 = 1:D2 = NR: GOTO
      5110
5050 I = NS + 1: PRINT : INPUT "ENTER THE FIRST MM, DD, YY TO BE        IN
     CLUDED: ";D%(I,1),D%(I,2),D%(I,3): GOSUB 8030:D3 = DN - DX
5060  PRINT : INPUT "ENTER LAST MM, DD, YY TO BE INCLUDED:   ";D%(I,1),D%(
     I,2),D%(I,3): GOSUB 8030:D4 = DN - DX
5070  FOR I = 1 TO NR:TE = R%(I)
5080  IF D%(TE,0) >  = D3 AND D1 > I THEN D1 = I
5090  IF D%(TE,0) <  = D4 AND D2 < I THEN D2 = I
5100  NEXT
5110  HOME : VTAB 5:IR = 0:DI = 0: FOR J = 1 TO MX:IR = IR + DI:X = 1 + IR
     :C1 = 0:C2 = 0: PRINT "ITER. #";:XX = J:W% = 3:X% = 0: GOSUB 6030: PR
     INT "  INT. RATE=";:XX =  FN A(IR):W% = 8:X% = 3: GOSUB 6030: PRINT
5120  FOR I = D1 TO D2:TE = R%(I):C1 = C1 + FL(TE) / X ↑ D%(TE,0):C2 = C2
     + D%(TE,0) * FL(TE) / X ↑ (D%(TE,0) + 1): NEXT
5130 DI = C1 / C2: IF  ABS (DI) < TL THEN IR = IR + DI: GOTO 5150
5140  NEXT : PRINT : PRINT "ITERATION LIMIT OF ";MX;" EXCEEDED": GOSUB 516
     0: GOTO 5260
5150  HOME :TB = 0: GOSUB 5160: GOTO 5260
5160  PRINT : PRINT  TAB( TB + 16)"RESULTS OF": PRINT  TAB( TB + 3)"INTERN
     AL RATE OF RETURN ANALYSIS": PRINT : PRINT
5170  PRINT  TAB( TB + 5)"CASH FLOWS FROM: ";:TE = R%(D1):XX = D%(TE,1):W%
      = 2:X% = 0: GOSUB 6030: PRINT "-";:XX = D%(TE,2): GOSUB 6030: PRINT
     "-";:XX = D%(TE,3): GOSUB 6030: PRINT
5180  PRINT  TAB( TB + 18)"TO: ";:TE = R%(D2):XX = D%(TE,1):W% = 2:X% = 0:
      GOSUB 6030: PRINT "-";:XX = D%(TE,2): GOSUB 6030: PRINT "-";:XX = D%
     (TE,3): GOSUB 6030: PRINT : PRINT
5190  PRINT  TAB( TB + 5)"EFFECTIVE ANNUAL INTEREST": PRINT  TAB( TB + 5)"
     RATE =";:XX =  FN A(IR):W% = 8:X% = 3: GOSUB 6030: PRINT " %": PRINT
5200  PRINT :C1 = 0:C2 = 0: FOR I = D1 TO D2:TE = R%(I): IF FL(TE) > 0 THE
     N C1 = C1 + FL(TE): GOTO 5220
5210 C2 = C2 + FL(TE)
5220  NEXT : PRINT  TAB( TB + 1)"SUM OF POSITIVE FLOWS =";:XX = C1:W% = 12
     :X% = 2: GOSUB 6030: PRINT
5230  PRINT  TAB( TB + 1)"SUM OF NEGATIVE FLOWS =";:XX = C2: GOSUB 6030: P
     RINT
5240  PRINT  TAB( TB + 4)"TOTAL OF ALL FLOWS =";:XX = C1 + C2: GOSUB 6030:
      PRINT
5250  PRINT : PRINT  TAB( TB + 1)"DAILY INTEREST RATE = ";IR: PRINT : PRIN
     T  TAB( TB + 2)J;" ITERATIONS": RETURN
5260  PRINT : INPUT "WANT RESULTS ON PRINTER (Y/N) ? ";A$: IF A$ <  > "Y"
     THEN  RETURN
5270  HOME : VTAB 4: PRINT "DO YOU WANT TO PRINT:": PRINT : PRINT "  (1) S
     UMMARY OF RESULTS (SAME AS SCREEN        OUTPUT)": PRINT "  (2) DETAILE
     D RESULTS (ALSO PRINTS THE        INDIVIDUAL CASH FLOWS)"
5280  PRINT : INPUT "WHICH NUMBER ? ";A

5290  ON A GOTO 5330,5370
5300  REM
5310  REM * PRINT SUMMARY RESULTS *
5320  REM
5330  GOSUB 5680: FOR L = 1 TO 10: PRINT : NEXT :TB = 20: GOSUB 5160: GOSU
     B 5720: RETURN
```

```
5340  REM
5350  REM * PRINT DETAILED RESULTS *
5360  REM
5370  PRINT : PRINT "WHAT TITLE DO YOU WANT ON EACH PAGE ?   ";: CALL 768:
     A1$ =  MID$ (IN$,1):PG = 0:LN = 0:C1 = 0:C2 = 0:N = 0:RV = 0:AS$ = "
      ": GOSUB 5680: GOSUB 5590: GOSUB 5630
5380  FOR I = D1 TO D2:TE = R%(I)
5390 XX = D%(TE,1):W% = 14:X% = 0: GOSUB 6030: PRINT "-";:XX = D%(TE,2):W%
      = 2: GOSUB 6030: PRINT "-";:XX = D%(TE,3): GOSUB 6030
5400 XX = FL(TE):W% = 15:X% = 2: GOSUB 6030
5410 C1 = C1 + FL(TE):N = N + 1: IF  SGN (C1) <  >  SGN (C2) AND N > 1 THE
     N AS$ = " *":RV = RV + 1
5420 XX = C1: GOSUB 6030
5430  PRINT  SPC( 4);AS$;
5440 XX = D%(TE,0) - D%(R%(D1),0):W% = 11:X% = 0: GOSUB 6030: PRINT
5450 C2 = C1:AS$ = "  ":LN = LN + 1: IF LN = 58 AND D2 - I > 3 THEN  GOSUB
      5590: GOSUB 5630
5460  NEXT
5470  PRINT : PRINT  TAB( 12)"* NUMBER OF REVERSALS IN CUMULATIVE CASH FLO
     W = ";RV:LN = LN + 2
5480  IF LN + 20 > 61 THEN  GOSUB 5590
5490  PRINT : PRINT : PRINT : PRINT  CHR$ (28);: POKE 36,17: PRINT "RESULT
     S": POKE 36,17: PRINT "-------"; CHR$ (29): PRINT : PRINT
5500  PRINT  TAB( 29)"CASH FLOWS FROM: ";:TE = R%(D1):XX = D%(TE,1):W% = 2
     :X% = 0: GOSUB 6030: PRINT "-";:XX = D%(TE,2): GOSUB 6030: PRINT "-";
     :XX = D%(TE,3): GOSUB 6030: PRINT
5510  PRINT  TAB( 42)"TO: ";:TE = R%(D2):XX = D%(TE,1):W% = 2:X% = 0: GOSU
     B 6030: PRINT "-";:XX = D%(TE,2): GOSUB 6030: PRINT "-";:XX = D%(TE,3
     ): GOSUB 6030: PRINT : PRINT
5520  PRINT  TAB( 18)"EFFECTIVE ANNUAL INTEREST RATE =";:XX =  FN A(IR):W%
      = 8:X% = 3: GOSUB 6030: PRINT " %": PRINT : PRINT
5530  PRINT :C1 = 0:C2 = 0: FOR I = D1 TO D2:TE = R%(I): IF FL(TE) > 0 THE
     N C1 = C1 + FL(TE): GOTO 5550
5540 C2 = C2 + FL(TE)
5550  NEXT : PRINT  TAB( 21)"SUM OF POSITIVE FLOWS =";:XX = C1:W% = 12:X%
     = 2: GOSUB 6030: PRINT
5560  PRINT  TAB( 21)"SUM OF NEGATIVE FLOWS =";:XX = C2: GOSUB 6030: PRINT

5570  PRINT  TAB( 26)"SUM OF ALL FLOWS =";:XX = C1 + C2: GOSUB 6030: PRINT

5580  PRINT : PRINT  TAB( 21)"DAILY INTEREST RATE = ";IR: PRINT : PRINT  T
     AB( 21)J;" ITERATIONS": GOSUB 5720: RETURN
5590 LN = 0:PG = PG + 1: IF PG > 1 THEN  PRINT  CHR$ (12);: PRINT : PRINT
     : PRINT : PRINT  TAB( 38)"-";PG;"-": PRINT : GOTO 5610
5600  PRINT : PRINT : PRINT : PRINT : PRINT
5610  PRINT  CHR$ (28); TAB( (42 -  LEN (A1$)) / 2)A1$
5620  PRINT : PRINT  TAB( 3)"* INTERNAL RATE OF RETURN ANALYSIS *"; CHR$ (
     29): PRINT : PRINT : RETURN
5630  POKE 36,39: PRINT "CUMULATIVE": PRINT  TAB( 15)"DATE";: POKE 36,25:
     PRINT "CASH FLOW";: POKE 36,40: PRINT "CASH FLOW";: POKE 36,55: PRINT
      "*";: POKE 36,62: PRINT "DAY #"
5640  PRINT  TAB( 13)"--------    -----------    -----------    ---    ---
     ---":LN = LN + 13: RETURN

5650  REM
5660  REM * TURN (MICROTEK) PRINTER ON *
5670  REM
5680  PRINT D$"PR#1": PRINT  CHR$ (9)"80N"; CHR$ (17); CHR$ (29): RETURN
5690  REM
5700  REM * TURN PRINTER OFF *
5710  REM
5720  PRINT  CHR$ (12); CHR$ (19): PRINT  CHR$ (9)"40N": PRINT D$"PR#0": R
     ETURN
6000  REM
6010  REM  ** FORMAT SUBROUTINE **
6020  REM
6030 XX = ( INT ( ABS (XX) * 10 ↑ X% + .5) *  SGN (XX) / 10 ↑ X%) * 1.0000
      0001:C =  INT ( ABS (XX)) *  SGN (XX):A$ =  STR$ (C): IF C = 0 AND XX
      < 0 THEN A$ = "-0"
```

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CIRCLE 126 ON READER SERVICE CARD

```
6035  IF X% < 1 THEN C$ = "": GOTO 6080
6040 C$ =  STR$ (X%): FOR C = 1 TO  LEN (C$): IF  MID$ (C$,C,1) = "." THEN
      C$ =  RIGHT$ (C$, LEN (C$) - C + 1):C$ =  LEFT$ (C$,X% + 1): GOTO 60
     60
6050  NEXT :C$ = "0"
6060  IF C$ = "0" THEN C$ = ".0"
6070  IF  LEN (C$) < X% + 1 THEN C$ = C$ + "0": GOTO 6070
6080 C = ( LEN (A$) - 1 - ( SGN (X%) =  - 1)) / 3:B% = 3
6090  REM  NOW INSERT COMMAS
6100  IF C < 1 THEN 6120
6110 A$ =  LEFT$ (A$, LEN (A$) - B%) + "," +  RIGHT$ (A$,B%):B% = B% + 4:C
      = C - 1: GOTO 6100
6120 A$ = A$ + C$: IF  LEN (A$) > W% THEN A$ =  LEFT$ ("******************
     *******",W%)
6130  PRINT  SPC( W% -  LEN (A$));A$;: RETURN
7000  REM
7010  REM  ** SORT & COMPRESS **
7020  REM USES INSERTION SORT
7030  REM IT'S USUALLY SLOW BUT IS
7040  REM FASTEST FOR PRE-SORTED DATA
7050  REM
7060 P3 =  PEEK (121) + 256 *  PEEK (122) + 1: POKE 103,P3 -  INT (P3 / 25
     6) * 256: POKE 104,P3 / 256
7070 I = 1: GOSUB 8030:DX = DN
7080  FOR J = 1 TO NR:I = R%(J): GOSUB 8030:D%(I,0) = DN - DX: NEXT
7090  FOR I = 2 TO NR:TM = R%(I)
7100  FOR J = I - 1 TO 1 STEP  - 1:TE = R%(J)
7110  IF D%(TE,0) <  = D%(TM,0) THEN 7130
7120 R%(J + 1) = TE: NEXT J
7130 R%(J + 1) = TM: NEXT I
7140  REM
7150  REM * COMBINE FLOWS WITH SAME DATES AND ELIMINATE $0.00 FLOWS *
7160  REM
7170 M = 0: IF NR < 2 THEN 7220
7180 TM = R%(1): FOR I = 2 TO NR:TE = R%(I): IF D%(TM,0) <  > D%(TE,0) THE
     N 7200
7190 FL(TM) = FL(TM) + FL(TE): GOTO 7210
7200  GOSUB 7230
7210  NEXT : GOSUB 7230
7220 NR = M:SR = 1: POKE 103,P1: POKE 104,P2: RETURN
7230  IF FL(TM) = 0 THEN 7250
7240 M = M + 1:R%(M) = TM
7250 TM = TE: RETURN
8000  REM
8010  REM **CALC. DAY # FROM M,D,Y **
8020  REM
8030 L3 = L2: IF D%(I,3) < 45 THEN L3 = 2000
8040 DN = K3 * (D%(I,3) + L3) -  INT (K7 * ((D%(I,3) + L3) +  INT ((D%(I,1
     ) + K5) / K6)) / K4) +  INT (K8 * D%(I,1) / K5) + D%(I,2): RETURN
8200  REM
8210  REM ** CALC. M,D,Y FROM DAY# **
8220  REM
8230 TM = DN + 32:YY =  INT ((TM - K9) / K2):D%(I,1) =  INT ((TM -  INT (K
     2 * YY)) / L1)
8240 D%(I,2) = TM -  INT (K2 * YY) -  INT (L1 * D%(I,1))
8250 D%(I,1) = D%(I,1) - 1
8260  IF D%(I,1) > K6 THEN D%(I,1) = D%(I,1) - K6
8270  IF D%(I,1) > 2 THEN D%(I,3) = YY - L2: GOTO 8290
8280 D%(I,3) = YY - 1899
8290  IF D%(I,3) > 99 THEN D%(I,3) = D%(I,3) - 100
8300  RETURN
9000  REM
9010  REM ** READ DATA FROM DISK **
9020  REM
9030  HOME : VTAB 5
9040  PRINT : PRINT " WHAT IS THE NAME OF THE DISKFILE YOU   WANT READ (DE
     FAULTS TO 'CATALOG') ?      ";: CALL 768:T$ =  MID$ (IN$,1)
```

```
9050  IF T$ = "" THEN  PRINT D$"CATALOG": GOTO 9040
9060  PRINT D$"OPEN"T$: PRINT D$"READ"T$
9070  INPUT NX
9080  FOR I = NS + 1 TO NS + NX:NR = NR + 1
9090  INPUT D%(I,1),D%(I,2),D%(I,3),FL(I):R%(NR) = I
9100  NEXT : PRINT D$"CLOSE":DK = 1:SR = 0:NS = NS + NX: RETURN
10000  REM
10010  REM  ** SAVE DATA TO DISK **
10020  REM
10030  HOME : VTAB 10: PRINT " WHAT NAME DO YOU WANT THE DATA SAVED   UNDE
      R ?": IF DK THEN  PRINT " (DEFAULT = ";T$;")."
10040  CALL 768:A$ =  MID$ (IN$,1): IF A$ <  > "" THEN T$ = A$
10050  PRINT D$"OPEN"T$: PRINT D$"DELETE"T$: PRINT D$"OPEN"T$: PRINT D$"WR
      ITE"T$
10060  PRINT NR
10070  FOR I = 1 TO NR
10080 K = R%(I)
10090  PRINT D%(K,1);",";D%(K,2);",";D%(K,3);",";FL(K)
10100  NEXT : PRINT D$"CLOSE": RETURN
11000  REM
11010  REM ** INITIALIZE **
11020  REM
11030 IN$ = "":N = 600: DIM D%(N,3),FL(N),R%(N),A1$(3)
11040 D$ =  CHR$ (13) +  CHR$ (4)
11050 P1 =  PEEK (103):P2 =  PEEK (104)
11060 K1 = 36525:K2 = 365.25:K3 = 367:K4 = 4:K5 = 9:K6 = 12:K7 = 7:K8 = 27
      5:K9 = 122.1:L1 = 30.6001:L2 = 1900
11070 A1$(1) = "DAYS":A1$(2) = "MONTHS":A1$(3) = "YEARS"
11080  DEF  FN A(X) = ((1 + X) ↑ K2 - 1) * 100
11090 TL = .0001 / K1:MX = 15
11100  REM
11110  REM  INPUT ANYTHING ROUTINE
11120  REM
11130  DATA 162,0,32,117,253,160,2
11140  DATA 138,145,105,200,169,0
11150  DATA 145,105,200,169,2,145
11160  DATA  105,76,57,213
11170  FOR I = 768 TO 790: READ J: POKE I,J: NEXT
11180  RETURN
12000  REM
12010  REM ** DESCRIPTION **
12020  REM
12030  PRINT "      THIS PROGRAM ALLOWS THE USER TO
12040  PRINT "CALCULATE THE YIELD (INTERNAL RATE OF
12050  PRINT "RETURN) OF A CASH FLOW STREAM. IT IS
12060  PRINT "MENU DRIVEN AND BASES IT'S INTERNAL
12070  PRINT "CALCULATIONS ON A TIME BASE OF ONE
12080  PRINT "DAY BASED ON THE CALENDAR DATES OF THE
12090  PRINT "CASH FLOWS.
12100  PRINT "      THE PROGRAM CAN GENERATE VARIOUS
12110  PRINT "SERIES' OF EQUAL-AMOUNT CASH FLOWS
12120  PRINT "SIMPLY BY ENTERING THE DATE AND AMOUNT
12130  PRINT "OF THE FIRST FLOW, THE INTERVAL
12140  PRINT "BETWEEN FLOWS (IN DAYS, MONTHS OR
12150  PRINT "YEARS), AND THE DATE OF THE LAST FLOW.
12160  PRINT "      CASH FLOWS 'TO' THE USER (INCOME
12170  PRINT "OR WITHDRAWALS) MUST BE ENTERED WITH A
12180  PRINT "SIGN OPPOSITE TO FLOWS 'FROM' THE USER
12190  PRINT "(INVESTMENTS OR DEPOSITS).
12200  PRINT "      IF DURING THE STUDY PERIOD THE
12210  PRINT "CUMULATIVE NET CASH FLOW (INVESTMENTS
12220  PRINT "MINUS WITHDRAWALS) CHANGES SIGN MORE
12230  PRINT "THAN ONCE, THERE MAY NOT BE A UNIQUE
12240  PRINT "RATE OF RETURN.
12250  PRINT "
12260  PRINT "HIT ANY KEY TO RETURN TO MENU";: GET A$: PRINT A$
12270  RETURN
```

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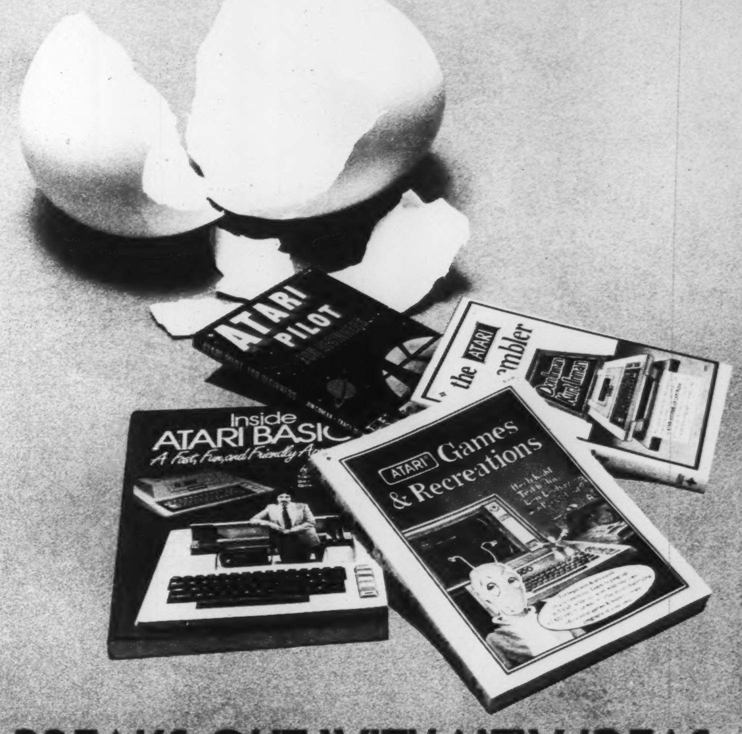
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An Investment Strategy Using Stock Options

Naked Call Writing

Jonathan Richards

It has been said that stock market investing and the computer go together like Brie and Chablis. In this article I hope to show you that this aphorism is true and that by using computer power you can tilt the investment odds significantly in your favor.

We will begin by discussing a deliciously complicated field of investing called stock options using *call options.* Next, I will outline a specific strategy, called naked call writing, that allows you to make a profit without directly investing any money. Finally, I will present a computer program that will help you find the best possible stock option on which to implement that strategy.

Before describing naked call writing, I want to issue two major caveats. First, it is very important to understand the concepts of stock option investing; they are complex. No one should invest without fully understanding the implications of his investment; yet the temptation is great to jump into option investing without being completely aware of all the risks.

Second, naked call writing has a statistically good chance of making a profit, and in fact is recommended by several respected writers, including the Value Line Advisory service but it can be very risky, and while there is no initial cash investment, your losses can be very large.

There are many types of investment strategies using options. There are spreads, straddles, naked puts, naked calls, covered writes, butterfly spreads, alligator spreads, and many others. The possibilities are limited only by the imagination of the investor. Naked call writing is one possibility that has a high mathematical chance of success.

What Is a Naked Call Write

A call option is a contract to sell a stock at a stated price, called the *strike price,* within a certain specified time. If you own the stock, your position is said to be *covered.* If you do not own the underlying stock, your position is said to be *naked.* In both covered and naked call writing you are the one who sells the option to a *call buyer.* You receive a premium for the call option, and in return you agree to deliver the stock to the buyer of your option for the strike price.

The most money you can make is the amount of the *premium* you receive. You hope the price of the stock will go down so that the buyer of your call option will not *exercise* it and you can keep the premium.

If Ashland Oil common stock is currently selling for $32.25 per share, you might be able to sell someone the right to buy 100 shares from you at a price of $35 per share. In return he would give you a premium of $275, and the option might be good until October. You would say you had sold an October-35 call for $2.75. (Options are sold in round lots of 100, but quoted in single option prices.)

You hope the price of Ashland Oil does not go above $35 per share before the October expiration date. If the price of Ashland goes to $40, you are obligated to buy it for that price and deliver it to the holder of the call option for $35 per share. Since Options are always sold in round lots of 100 shares, you must buy the stock for $4000 and sell it for $3500, for a $500 loss.

But you did receive a $275 premium, so your actual loss is only $225. Your losses could be even greater if you were unlucky enough to pick a stock that went to $50 a share or more.

Why would anyone invest in something that has a profit limited to the premium received and a loss that may be unlimited? First, you do not have to hold the call option until expiration; you can buy it back on the open market whenever you want to close out your position. Losing positions can be closed out at almost any time.

You have two ways of satisfying your obligation to deliver 100 shares of Ashland Oil at $35 per share to the call buyer. You can buy the stock on the open market; or you can buy the call option that you previously sold.

The call option price, like the stock market price, is quoted in the paper daily, it fluctuates up and down, and is very liquid. It is usually more profitable to buy back the call option and close out your position than to buy and deliver the stock, since the commission is smaller on option transactions than on stock transactions.

The second reason people sell naked call options is that as time goes by the $2.75 premium you received, and for which you have an obligation to buy back or deliver 100 shares of Ashland Oil, is decaying. That is, as the expiration date of October 21, 1983 draws closer, you can purchase the October-35 call for, perhaps, $1.75, then $1, then maybe $0.25.

The less you pay to purchase the call option the greater your profit; and you hope the call will expire, so you won't even have to purchase it to close the position. In other words, for you to lose money, the stock must make a dramatic move upward. If it goes down in price or remains at the same price you will make a profit.

In And Out Of The Money Calls

Let's consider it another way. There are three types of calls.

There are *in-the-money calls, at-the-money calls,* and *out-of-the-money calls.* These concepts are sometimes difficult for the new investor; yet once they are understood all the strategies and positions become clear.

To explain these three types of call option we need to explain two more terms, *time value* and *intrinsic value* of the call

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premium. The intrinsic value of a call option premium is the value in the call premium if the call were immediately exercised. Or to put it another way, the intrinsic value is the market price of the stock less the strike price of the option.

The time value part of the call option premium is the value that the buyers and sellers of options place on the time remaining until the option expires, and for the hope that the stock price will rise between now and the expiration date. Therefore, option premiums have been called a *wasting asset.* As time goes by, and the call option gets closer to expiration it will get cheaper and cheaper. Time is on the side of the call seller.

A call option seller is really only selling time value. An in-the-money call option has a premium that is made up partly of time value and partly of intrinsic value. For example, if the price of Ashland is $36 a share and you are selling an October-35 call, the premium would probably be $3.75 rather than $2.75 per Call, as in the above example, since there is $1 of intrinsic value in the call. That is, the stock can be called away for $35 with the stock at $36; so the call premium has $1 of instrinsic value, and the rest of the premium, in this case $2.75, reflects merely the time value of the option.

In the first example, with the strike price at $35 and Ashland Oil selling for only $32.25 per share, the October-35 call is said to be out-of-the-money. An out-of-the-money call option occurs when the strike price is higher than the stock price. The premium you received, in this case $2.75, consists entirely of time value. If the stock does not change in price between now and the expiration date, that time value will decay to zero, and you will keep the premium.

At-the-money calls are those that have strike prices that are close to or equal to the stock price. An example of an at-the-money call is one where the strike price is $35 and the stock is selling for $35.

In summary, if you write a call option for which the price of the underlying stock is higher than the strike price of the call, then the premium must include the intrinsic value and the time value, and the call is said to be in-the-money.

An out-of-the-money call has a strike price that is higher than the stock price, and the premium is made up only of time value. These concepts are essential in making good options investments, because writing out-of-the-money calls has different risks and profits than writing in-the-money calls. Later, I will, in fact, recommend writing at-the-money calls.

Collateral

Besides an understanding of in-the-money and out-of-the-money call options and time value and intrinsic value, we must consider the *collateral* required to write naked calls. As mentioned, you receive a premium from the call buyer. This premium goes into your account as cash and earns interest. You have no cash outlay for your naked write investment, and you earn interest on money you did not previously have.

Your broker, however, wants to be sure you will deliver should the stock, in this case Ashland Oil, be *called away.* That is, if the holder of your call option decides he wants to buy the stock from you at the strike price, you must deliver it to him. To insure your performance, the broker requires that you have cash or other securities in your account.

First, he may require equity in your portfolio which may vary from $2000 to $25,000 on deposit with him. This amount depends on your broker. In addition, each naked call position requires a certain amount of collateral or *margin,* which also varies with each broker. Generally, the requirement is 30% of the price of the stock plus the amount the stock is in-the-money or minus the amount it is out-of-the-money. There is a minimum of $250 per call. The premium received is used to offset this collateral requirement.

If you sell six October-35 calls on Ashland Oil with Ashland selling for $32.25 per share your collateral or margin requirement is $2505. This amount can be in other stocks or in a money market account with the broker.

The $2505 was arrived at in the following way: The stock is at $32.25 and 30% of that is $9.675. It is $2.75 out-of-the-money–$35 strike less the $32.25 price. So $2.75 from $9.675 is $6.925; less the $2.75 premium per call you received is $4.175. Since calls are always written on 100 shares, you must multiply $4.175 times the 600 calls you sold which gives you $2505.

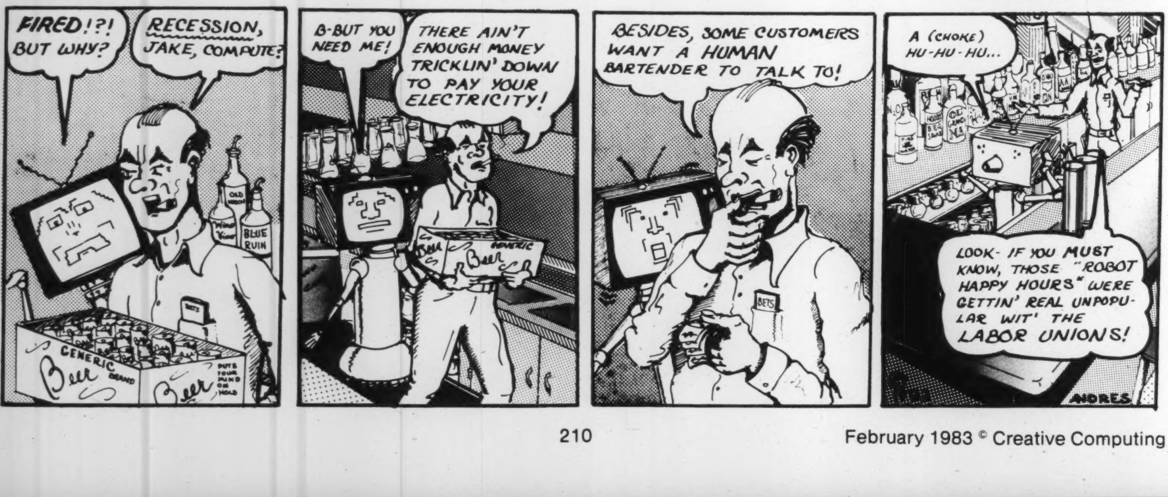
Figure 1 gives us this figure plus $36 in commissions or $2541. We can always subtract the premium we receive, but if the call were in-the-money we would have had to add the difference between the stock price and the strike price. For a more detailed description of collateral requirements you can write to the Chicago Board of Options Exchange for any of their several excellent booklets. Collateral is important to understand since in these strategies it is used to figure your return on investment and to compare different naked writes one with another.

Choosing A Naked Write

There are five factors to consider in choosing an option to sell or write. First, we need to find a stock that we feel will not rise in price. The program presented here does not really deal with choosing a poor stock, it concentrates on finding a

Bit Pit

Chas Andres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good call option. But in choosing a poor stock it is usually best to use an advisory service or your broker. It seems much easier to pick a stock that will not rise in price than to pick one that will rise. Of course, if you make a mistake and pick a stock that takes off, the consequences, as discussed above, can be disastrous.

Next we need to consider whether to write an option on a stock that is in-the-money, at-the-money, or out-of-the-money. As mentioned, call options that are at-the-money have the greatest time value, and it is time value that we want to sell. Writing far out-of-the-money calls with the stock at, say, $25 and the strike price at $40, and receiving a correspondingly small option premium, appears attractive since the chance of a stock rising that much is remote. That is one way of earning small profits, with a very large risk should the stock rise.

Or you can write deeply in-the-money calls, with the strike price at, say, $25 and the stock selling for $15. In this case, the premium you receive might be $10.125 ($10 of intrinsic value and $0.125 of time value). So the time premium you earn is only 0.125 of a point, or $12.50. The only way you could earn a large profit would be if the stock dropped in price. Selling deeply in-the-money calls is much like selling a stock short.

A third factor to consider in choosing a naked write is whether the call is *overvalued.* If it is, it may be a good candidate for selling. Although supply and demand set option premiums, they are influenced by the price of the stock, the volatility of the stock, the time to expiration of the option, risk-free interest rates, dividends on the stock, and other factors.

While these are difficult to objectify, several attempts have been made to do so by several theoreticians, most notably Fisher Black and Myron Scholes. The Black-Scholes mathematical model allows the input of the 90-day T-bill interest rate, time to expiration of the option, and the volatility of the underlying stock, and then predicts a theoretical value for the call premium. This formula is so widely used that you can even buy calculators with the functions built in. So if we calculate what a premium should be and determine what that figure is more than the actual premium, we might consider the call overpriced and sell it. If it is under-priced, we would not want to sell it.

A fourth factor in considering which option to sell has to do with the concept of the volatility of the underlying stock mentioned above. Volatility is a statistical term and is determined by the annual standard deviation of stock price movements. You can get the volatility of a stock from your broker, and advisory service, a simple computer program, or even a pocket calculator.

A volatility of 33% means that the stock will fluctuate about 33% from its current price about two thirds of the time. While this is only a probability measure, it is a most useful tool in deciding what position to invest in.

Using this concept, we can predict the statistical chance that the stock will rise above the breakeven point. We look for those that have a good chance of not rising past that breakeven point. If Ashland Oil had a volatility figure of 33% and a breakeven point of 37.69, it is possible statistically to say that there is a 79% chance that Ashland Oil will not rise above 37.69.

This figure is deduced by assuming that stock prices on a single stock have a

Glossary

Bear—One who thinks the price of a stock will drop. To take a bearish position means that a profit will be made if the stock drops in price.

Bull—One who thinks a stock will rise in price. To have a bullish position on an option implies that a profit will be made if the stock rises in price.

Call—A contract to purchase 100 shares of a stock at a stated price, called the strike price, within a specified period of time.

Call Buyer—One who buys the call and who has the privilege of calling or buying 100 shares of the stock at the strike price from the seller of the call.

Call Seller or Write—One who sells the call and who receives the premium from the buyer. The writer has the obligation to deliver the stock to the call buyer at the strike price.

Collateral—In selling naked options you do not ordinarily need to put up any money since you are selling not buying. But the options exchanges and brokers require that you have a certain amount of collateral in your account to insure that you are able to buy back the option sold. This amount is usually in your account as cash, stock, or other securities. The collateral requirements are different for each broker.

Covered—Means you own the stock and have sold a call on that stock. The call is said to be covered.

Exercise Price—Also called the strike price. It is the price at which the owner of the call option can purchase the underlying stock.

Expiration Date—The date beyond which an option is no longer valid. Listed options expire three months apart. Options can be exercised at any time during the life of that option. You do not have to wait until the expiration date.

In-The-Money—When the strike price of a call option is les than the price of the underlying stock the premium is in-the-money.

Intrinsic Value—The difference between the stock price and the strike price.

Long—Means that you own the stock or option and to close out the position you must sell it.

Naked—If you sell a call and do not own the underlying stock, then your position is naked.

Out-of-The-Money—When the strike price of a call option is greater than the price of the underlying stock, the premium is out-of-the-money.

Premium—The price of an option. It is the only variable. Strike price and expiration dates do not change.

Short—Means you sold the stock or option before buying it, and to close the position you must buy it back as a closing transaction. This term is confusing to new investors. You can borrow a stock and sell it, and then if you can buy it back later at a lower price you will make a profit. This is called being short the stock. You can also be short a call option. It is a bearish position, since a profit is made if the stock goes down in price.

Strike Price—Same as exercise price.

Time Value—Teh amount by which an options premium exceeds its intrinsic value. Longer term options have greater time value.

Underlying Common Stock—Options are called derivative securities because they are always written or derived from other securities—most often underlying stocks. The value of an option is in direct relationship to the value of the underlying stock.

Upside and Downside Breakeven—These are the points in an options strategy at which you will lose money. If the upside breakeven is 37, then you will lose money if the stock moves to 37, and you will need to take defensive action. Downside breakeven is the lower point at which you begin to lose money.

Voliatility—A statistical measure of the amount by which an underlying security is expected to fluctuate in a given period of time. Generally measured by the annual standard deviation of the daily stock price changes in the security.

Write—See call seller.

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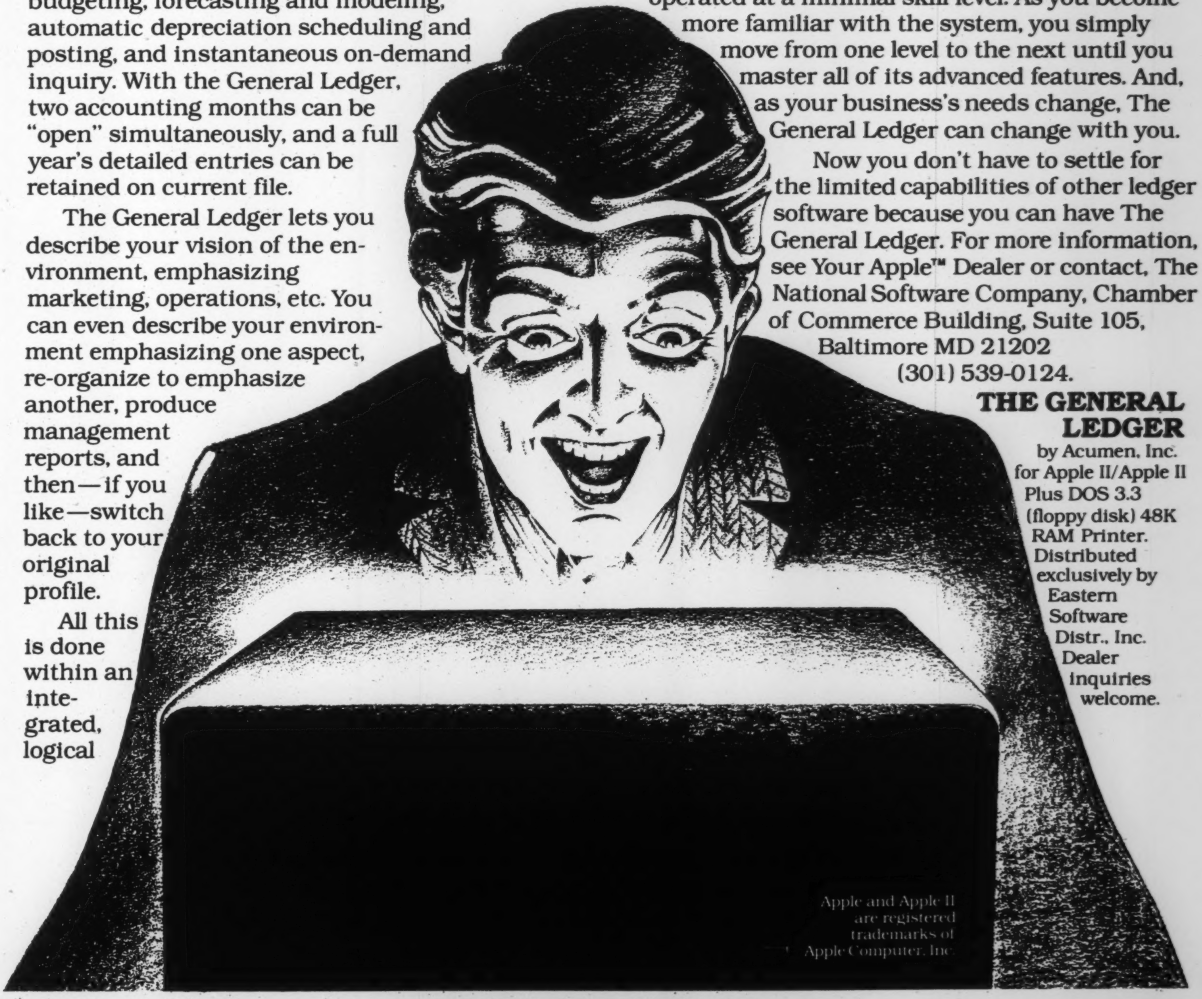

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log normal distribution, which seems to be empirically true.

Finally, we want to locate stock and option positions that offer a good annualized return on the collateral required. All returns must be annualized for easy comparison with other potential investments.

In summary, we want to locate naked writing positions that allow us to sell over-valued calls on stocks that will perform poorly, that have a good statistical chance of not rising past the point at which we will lose money, and that offer an excellent annual percentage return on our collateral.

The Computer And Naked Calls

Figure 1 is the printout from the Naked Call Writing program. It shows the calculations on all of the items discussed above.

The first section is a summary of a position on Ashland Oil with the stock at $32.25 per share. We sold six October-35s and received a premium of $2.75 per call or $1614 in premiums deducting a commission of $36.

The second section has computed the theoretical value of the option at $1.91 per call. The call, thus, appears to be overvalued by $0.84 or 30.52%–perhaps a good candidate for selling.

The third section shows the maximum profit to be realized if Ashland Oil is at $32.25 at the expiration date on October 21, 1983. It also shows the annualized percentage return based on the collateral required on the day the naked option was written. Item 3 in the third section gives the statistical probability of the stock moving past the breakeven point of $37.69.

With a 79% chance of the stock staying below the breakeven point, and an overpriced call that gives us a potential profit of $1614 on $2541 worth of collateral this looks like a good investment. The Index is an arbitrary number composed of the amount by which the call is over-priced, the days to expiration, the percent of return, and the chance of making a profit. I have never lost money on a position that had an Index over 30. The higher the Index, the better the investment. But, you must always realize that losses can be great; overconfidence has hurt many an investor.

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SELLING AN OUT-OF-THE-MONEY CALL    #1
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   6 OCT-35 CALLS ON ASHLAN @ $32.25
COMMISSION:  $36        VOLATILITY:  33%
========================================

 1.  THEORETICAL CALL VALUE......$1.91
 2.  ACTUAL CALL VALUE...........$2.75
   * THIS CALL IS  OVERPRICED  BY .84
    OR BY 30.68%--RECOMMEND YOU SELL IT.
----------------------------------------

 1. POTENTIAL PROFIT UNCHANGED..$1614
 2. ANNUALIZED RETURN UNCHANGED..177%
 3. % CHANCE OF MAKING PROFIT....78%
              ** INDEX: 31 **
========================================

 1.  MAXIMUM POSSIBLE PROFIT.....$1614
 2.  ANNUALIZED % RETURN..........96%
 3.  LOSS-STCK RISES 16.87% TO...$37.69
 4.  COLLATERAL TODAY............$2541
 5.  COLLATERAL @ STRIKE.........$4686
 6.  COLLATERAL 15% STOCK RISE...$6314
 7.  DAYS TO EXPIRATION...........131
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Figure 1.

The fourth section of the output has additional facts to help you choose an investment. If the call was originally out-of-the-money, then the maximum possible return is the same as the return unchanged, i.e. the stock is at the same price at expiration as it is today. While this is unlikely, it offers the best way to compare between investments. If the call was in-the-money, then the two figures would be different. The best comparison between positions is available only if the stock price at the call expiration is the same as the stock price when you established the naked write position.

Item 3 in this section indicates the point to which the stock can rise before a loss occurs. The next three items are various collaterals that may be required should the stock price rise to the strike price or increase by 15%. It is a good idea to have extra collateral in your account, in case the stock does not move against you and you still want to maintain the position.

The program is written so that you can enter up to 30 different possible naked write investments at one time and compare each. A printer is not necessary, but is helpful.

In summary, naked call writing is an effective strategy for adding extra income to your portfolio and should repay diligent study and close monitoring.

The program is written for an Apple computer, but should be easily translatable to other Basics. If you would like a copy of this program, and a Black-Scholes program to find the volatility or fair value of calls for other option strategies, and a follow-up program to Naked Call Writing called Rolling for Credits send $6.50 and I will mail you all three programs. ☐

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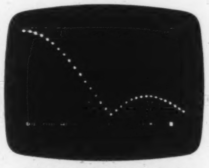
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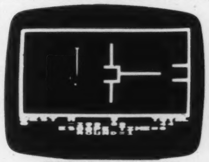
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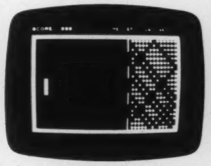
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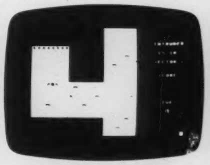
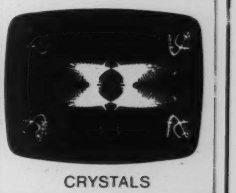

INTRUDER ALERT

DYNACOMP P.F.S.
PERSONAL FINANCE SYSTEM


CRYSTALS

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CIRCLE 162 ON READER SERVICE CARD

Naked Call Writing, continued...

```
                                       ******************************
                                       *                            *
                                       *     NAKED CALL WRITING     *
10  TEXT : HOME                        *                            *
20  DEF  FN A(OO) =  INT (OO * 100 + .5) / 100    *      MAY 1982       *
23  DEF  FN B(OO) =  INT (OO + .5)     ******************************
25  DEF  FN C(OO) =  EXP ( - (OO ^ 2 / 2))
27  GOSUB 5000: REM  * OPENING SUB *
30  VTAB 10: HTAB 7: INVERSE : PRINT "PRINTER OR SCREEN   (P / S) ?": NORMAL : G
ET P$: HOME : VTAB 4
31  IF P$ <  > "P" AND P$ <  > "S" THEN 30
50  DIM ANRET(30): DIM BRVN(30): DIM CA$(30): DIM W(300): DIM VOL(30): DIM SRT(3
0): DIM I1(30): DIM I2(30): DIM I3
    (30): DIM I4(30): DIM II(30)
51  DIM CLL(30): DIM CM(30): DIM DCLL(30): DIM DTE(30): DIM UPPRICE(30): DIM NU(
30): DIM PCNT(30): DIM POFIT(30): DIM
    OCPRICE(30)
52  DIM PRICE(30): DIM RET(30): DIM STCK$(30): DIM STRIKE(30): DIM UCPOFIT(30):
DIM UNRET(30): DIM N1(30): DIM SCL
    L(30)
100  REM  * INPUT **
150  HOME : VTAB 4: INPUT "CURRENT INTEREST RATE ON 90-DAY T-BILLS?     (AS A DE
CIMAL E.G. 15% = .15) ?
            ";R
200  INPUT "TODAY'S DATE (MM/DD/YY) ? ";A$:D$ = A$: GOSUB 780: IF ER = 1 THEN ER
 = 0: GOTO 200: REM     * CHECK DA
    TE ERROR SUB **
202 B$ = A$: GOSUB 2600:CA$ = CA$(I): REM   * NAME TODAY'S DATE *
203  FOR I = 1 TO 30
204 RP = RP + 1
205  HTAB 13: INVERSE : PRINT "CALL WRITE #"RP: NORMAL : PRINT : PRINT : PRINT
210  INPUT "STOCK NAME ?";STCK$(I)
215 : IF STCK$(I) = "" THEN  GOSUB 6260: GOTO 210
220  INPUT "STOCK PRICE ?  ";PRICE(I)
230  INPUT " CALL STRIKE ?";STRIKE(I)
240  INPUT "DATE CALL EXPIRES (MM/DD/YY) ? ";B$:D$ = B$: GOSUB 780:: IF ER = 1 T
HEN ER = 0: GOTO 240: REM         *
     CHECK DATE ERROR SUB **
245  GOSUB 2600: REM  * NAME THE CALL **
250  GOSUB 6000: REM  * GET DAYS BETWEEN DATES **
251  IF DTE(I) =  < 0 THEN  HOME : VTAB 5: PRINT "ERROR:  OPTION MUST EXPIRE AFT
ER TODAY!   TRY AGAIN": FOR DL = 1
     TO 1300: NEXT DL: GOTO 240
260  PRINT "PREMIUM RECEIVED (PER CALL) FOR   THIS         "CA$(I)"-"STRIKE(I)"
?";: INPUT OCPRICE(I)
270  INPUT "NUMBER OF CALLS SOLD ?";NU(I):: GOSUB 4000: REM    * GET COMISSION *
*
280  INPUT " VOLITATILITY (AS A DECIMAL) ? ";VOL(I)
500  GOSUB 2010: REM *PROFIT SUB *
510  GOSUB 2100: REM  BREAKEVEN SUB **
520  GOSUB 2200: REM  * PERCENT DROP *
530  GOSUB 2300: REM  * COLLATERAL SUB *
540  GOSUB 2400: REM  * POTENTIAL % RETURN **
550  GOSUB 2500: REM  * RETURN IF UNCHANGED **
560  GOSUB 3000: REM  * GET ANNUALIZED RETURNS **
595  IF RP = 30 THEN  HOME : VTAB 5: PRINT " YOU CAN ONLY INPUT 30 CALLS AT A TI
ME !        THE COMPUTER WILL NOW
    DO                            THE ANALYSIS.": FOR DL = 1 TO 1500: NEXT DL: GOTO 1
000
599  HOME : PRINT " IF FINISHED TYPE END-ELSE HIT RETURN ": INPUT L$: IF L$ = "E
ND" THEN 1000
600  GOTO 800
780  REM   ** DATE ERROR SUB **
786  REM   ** TODAY'S DATE ERRORS **
787  IF  VAL ( MID$ (D$,1,2)) > 12 THEN 798
788  IF  VAL ( MID$ (D$,1,2)) < 1 THEN 798
791  IF  VAL ( MID$ (D$,4,2)) > 31 THEN 798
792  IF  MID$ (D$,3,1) <  > "/" THEN 798
793  IF  MID$ (D$,6,1) <  > "/" THEN 798
794  IF  VAL ( MID$ (D$,4,2)) < 1 THEN 798
795  IF  VAL ( MID$ (D$,7,3)) > 99 THEN 798
796  IF  LEN (D$) >  < 8 THEN 798
797  RETURN
```

```
798  PRINT  TAB( 15);: FLASH : PRINT "DATE ERROR": NORMAL : PRINT  TAB( 11)"PLEA
SE TRY AGAIN !": PRINT : FOR BB =
     1 TO 1400: NEXT BB: VTAB 20:ER = ER + 1: RETURN
800  NEXT I
900  REM ***********
901  REM *         *
902  REM *         *
903  REM *  OUTPUT  *
904  REM *         *
905  REM *         *
906  REM ***********
1000  REM  :
1001  FOR I = 1 TO RP
1002 FL = 0: PR# 0
1003  HOME : VTAB 8: HTAB 16: FLASH : PRINT "WORKING...": NORMAL : VTAB 21: PRIN
T  TAB( 5)"THIS WILL TAKE ABOUT 13
      .5 SECONDS.": GOSUB 4500: REM    * GET THEORETICAL CALL VALUE *
1004  GOSUB 4900: REM  * GET PROBABILITY PERCENT *
1005 W(I) = W: NORMAL : HOME : IF P$ = "P" THEN  PR# 1: PRINT  CHR$ (10): PRINT
 CHR$ (10): FOR LN = 1 TO 20: PRINT
      "* ";: NEXT LN: GOSUB 8002
1006  GOSUB 3100: REM  * GET INDEX SCORE *
1007  IF STRIKE(I) < PRICE(I) THEN  PRINT "SELLING AN IN-THE-MONEY CALL"; TAB( 3
5)"#"I
1008  IF STRIKE(I) > PRICE(I) THEN  PRINT "SELLING AN OUT-OF-THE-MONEY CALL"; TA
B( 36)"#"I
1009  IF STRIKE(I) = PRICE(I) THEN  PRINT "SELLING AN AT-THE-MONEY CALL"; TAB( 3
5)"#"I
1011  PRINT CA$;" " MID$ (A$,4,2);", 19"; RIGHT$ (A$,2); TAB( 22)"T-BILLS: "R *
100"%"
1020  PRINT  TAB( 4)NU(I);" "CA$(I)"-"STRIKE(I)" CALLS ON " LEFT$ (STCK$(I),6)"
@ $" FN A(PRICE(I))
1030  PRINT "COMMISSION:  $"CM(I) TAB( 22)"VOLITILITY:  "VOL * 100"%": GOSUB 800
2
1032  IF DTE(I) > 270 THEN FL = 1
1033  IF VOL(I) > 1 THEN FL = 1
1035  IF FL = 1 THEN W(I) = 0:N1(I) = 0:SRT(I) = 0:DTE(I) = 0
1040  PRINT " 1.  THEORETICAL CALL VALUE......$" FN A(W(I))
1050  PRINT " 2.  ACTUAL CALL VALUE...........$" FN A(OCPRICE(I))
1051  IF FL = 1 THEN  PRINT : PRINT " THE DATA DOES NOT APPEAR TO BE
LEGITIMATE....YOU MIGHT WISH TO
           RE ENTER THIS CALL POSITION.": GOTO 1060
1052  IF W(I) = OCPRICE(I) THEN  PRINT  TAB( 6)"* THIS CALL IS FAIRLY VALUED *
1054  IF W(I) > OCPRICE(I) THEN  PRINT  TAB( 4)"* THIS CALL IS ";: INVERSE : PRI
NT " UNDERPRICED ";: NORMAL : PRINT
      " BY "; FN A(W(I) - OCPRICE(I)): PRINT  TAB( 6)"OR BY " FN A(((W(I) - OCPRI
CE(I)) / OCPRICE(I)) * 100)"%--";
1056  IF W(I) > OCPRICE(I) THEN  PRINT "DO NOT SELL IT."
1057  IF W(I) < OCPRICE(I) THEN  PRINT  TAB( 4)"* THIS CALL IS ";: INVERSE : PRI
NT " OVERPRICED ";: NORMAL : PRINT
      " BY "; FN A(OCPRICE(I) - W(I)): PRINT  TAB( 5)"OR BY " FN A(((OCPRICE(I) -
 W(I)) / OCPRICE(I)) * 100)"%--";
1058  IF W(I) < OCPRICE(I) THEN  PRINT "RECOMMEND YOU SELL IT."
1060  GOSUB 8001
1070  PRINT " 1. POTENTIAL PROFIT UNCHANGED..$" FN B(UCPOFIT(I))
1080  PRINT " 2. ANNUALIZED RETURN UNCHANGED.." FN B(UNRET(I))"%"
1090  PRINT " 3. % CHANCE OF MAKING PROFIT...." FN B(N1(I))"%"
-1100  PRINT  TAB( 13)"** INDEX: "SRT(I)" **
1110  GOSUB 8002
1120  PRINT " 1.  MAXIMUM POSSIBLE PROFIT.....$" FN B(POFIT(I))
1130  PRINT " 2.  ANNUALIZED % RETURN.........." FN B(ANRET(I))"%"
1140  PRINT " 3.  LOSS-STCK RISES " FN A(PCNT(I))"% TO...$" FN A(BRVN(I))
1150  PRINT " 4.  COLLATERAL TODAY............$" FN B(CLL(I))
1160  PRINT " 5.  COLLATERAL @ STRIKE.........$" FN B(SCLL(I))
1170  PRINT " 6.  COLLATERAL 15% STOCK RISE...$" FN B(DCLL(I))
1180  PRINT " 7.  DAYS TO EXPIRATION..........."DTE(I)
1980  GOSUB 8002
1982  IF P$ = "P" THEN  GOSUB 3500
1984  IF P$ <  > "P" THEN  GOSUB 8010
1985  NEXT I
1990  PR# 0
```

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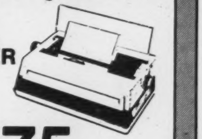

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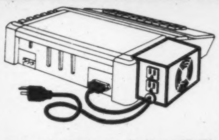

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CIRCLE 139 ON READER SERVICE CARD

Naked Call Writing, continued...

```
1999  END
2000  REM   ** CALL WRITING CALCS.
2010  REM * POTENTIAL PROFIT SUB *
2020 POFIT(I) = ((NU(I) * OCPRICE(I)) * 100) - CM(I)
2050  RETURN
2100  REM  *BREAKEVEN SUB *
2110 BRVN(I) = STRIKE(I) + (POFIT(I) / (NU(I) * 100))
2150  RETURN
2200  REM   * PERCENT RISE BEFORE LOSS *
2210 P1 = BRVN(I) - PRICE(I):PCNT(I) = (P1 / PRICE(I)) * 100
2250  RETURN
2300  REM  * COLLATERAL SUB *
2305  REM  * COLLATERAL TODAY *
2310 CLL(I) = (((PRICE(I) * .30) + (PRICE(I) - STRIKE(I))) * (NU(I) * 100)) - PO
FIT(I)
2315  IF CLL(I) < (250 * NU(I)) THEN CLL(I) = 250 * NU(I)
2318  REM  * COLLATERAL A 15% RISE *
2320 UPPRICE(I) = (PRICE(I) + (PRICE(I) * .15))
2350 DCLL(I) = (((UPPRICE(I) * .30) + (UPPRICE(I) - STRIKE(I))) * (NU(I) * 100))
 - POFIT(I)
2360  IF DCLL(I) < (NU(I) * 250) THEN DCLL(I) = (NU(I) * 250)
2365  REM  * COLLATERAL @ STRIKE *
2370 SCLL(I) = (((STRIKE(I) * .3) + (STRIKE(I) - STRIKE(I))) * (NU(I) * 100)) -
POFIT(I): REM  * COLLATERAL REQUIR
     ED IF STOCK RISES TO STRIKE *
2371  IF SCLL(I) < (250 * NU(I)) THEN SCLL(I) = 250 * NU(I)
2390  RETURN
2400  REM  * PERCENT RETURN **
2410 RET(I) = (POFIT(I) / SCLL(I)) * 100: REM   *COLLATERAL BASED ON STOCK RISIN
G TO STRIKE *
2500  REM  * RETURN IF UNCHANGED *
2510  IF STRIKE(I) >  = PRICE(I) THEN UCPOFIT(I) = POFIT(I): RETURN
2520 OCPRICE = PRICE(I) - STRIKE(I): GOSUB 4000: REM  * GET COMMISSION ON REPURC
HASE OF CALL SINCE  IS IN THE MONE
     Y  **
2530 UCPOFIT(I) = ((OCPRICE(I) - (PRICE(I) - STRIKE(I))) * NU(I) * 100) - CM(I)
2540  RETURN
2600  REM  * NAME THE CALL **
2605  IF  LEFT$ (B$,2) = "01" THEN CA$(I) = "JAN"
2610  IF  LEFT$ (B$,2) = "02" THEN CA$(I) = "FEB"
2620  IF  LEFT$ (B$,2) = "03" THEN CA$(I) = "MAR"
2630  IF  LEFT$ (B$,2) = "04" THEN CA$(I) = "APR"
2640  IF  LEFT$ (B$,2) = "05" THEN CA$(I) = "MAY"
2650  IF  LEFT$ (B$,2) = "06" THEN CA$(I) = "JUN"
2660  IF  LEFT$ (B$,2) = "07" THEN CA$(I) = "JUL"
2670  IF  LEFT$ (B$,2) = "08" THEN CA$(I) = "AUG"
2680  IF  LEFT$ (B$,2) = "09" THEN CA$(I) = "SEPT"
2690  IF  LEFT$ (B$,2) = "10" THEN CA$(I) = "OCT"
2700  IF  LEFT$ (B$,2) = "11" THEN CA$(I) = "NOV"
2710  IF  LEFT$ (B$,2) = "12" THEN CA$(I) = "DEC"
2720  RETURN
3000  REM  * ANNUALIZED MAX & UNCHANGED RETURNS*
3010 ANRET(I) = ((RET(I) / DTE(I)) * 365.25)
3015 U1 = (UCPOFIT(I) / CLL(I)) * 100
3020 UNRET(I) = (U1 / DTE(I)) * 365.25
3030  RETURN
3100  REM  * SORT INDEX *
3110  REM * POINTS FOR % CHANCE STOCK WILL BE ABOVE BREAKEVEN *
3120  IF N1(I) <  = 50 THEN I1(I) =  - 10
3122  IF N1(I) > 50 AND N1(I) <  = 55 THEN I1(I) = 1
3124  IF N1(I) > 55 AND N1(I) <  = 60 THEN I1(I) = 2
3126  IF N1(I) > 60 AND N1(I) <  = 70 THEN I1(I) = 3
3128  IF N1(I) > 70 AND N1(I) <  = 80 THEN I1(I) = 4
3129  IF N1(I) > 80 AND N1(I) <  = 90 THEN I1(I) = 5
3130  IF N1(I) > 90 THEN I1(I) = 6
3200  REM  * POINTS FOR ANNUALIZED RETURN  UNCHANGED *
3210  IF UNRET(I) =  < 15 THEN I2(I) =  - 10
3212  IF UNRET(I) > 15 AND UNRET(I) <  = 20 THEN I2(I) = 1
3214  IF UNRET(I) > 20 AND UNRET(I) <  = 25 THEN I2(I) = 2
3216  IF UNRET(I) > 25 AND UNRET(I) <  = 30 THEN I2(I) = 3
3218  IF UNRET(I) > 30 AND UNRET(I) <  = 40 THEN I2(I) = 4
3220  IF UNRET(I) > 40 AND UNRET(I) <  = 50 THEN I2(I) = 5
3222  IF UNRET(I) > 50 AND UNRET(I) <  = 60 THEN I2(I) = 6
3224  IF UNRET(I) > 60 AND UNRET(I) <  = 70 THEN I2(I) = 7
3226  IF UNRET(I) > 70 AND UNRET(I) <  = 80 THEN I2(I) = 8
3228  IF UNRET(I) > 80 AND UNRET(I) <  = 90 THEN I2(I) = 9
3230  IF UNRET(I) > 90 THEN I2(I) = 10
3400  REM * POINTS FOR DAYS TILL EXPIRATION *
3410  IF DTE(I) < 5 THEN I3(I) =  - 4
3412  IF DTE(I) > 220 THEN I3(I) =  - 10
3413  IF DTE(I) > 5 AND DTE(I) <  = 25 THEN I3(I) = 3
3414  IF DTE(I) > 25 AND DTE(I) <  = 40 THEN I3(I) = 6
3416  IF DTE(I) > 40 AND DTE(I) <  = 60 THEN I3(I) = 9
3418  IF DTE(I) > 60 AND DTE(I) <  = 90 THEN I3(I) = 10
3420  IF DTE(I) > 90 AND DTE(I) <  = 120 THEN I3(I) = 9
3422  IF DTE(I) > 120 AND DTE(I) <  = 140 THEN I3(I) = 7
8424  IF DTE(I) > 140 AND DTE(I) <  = 160 THEN I3(I) = 5
3426  IF DTE(I) > 160 AND DTE(I) <  = 180 THEN I3(I) = 3
3428  IF DTE(I) > 180 AND DTE(I) < 220 THEN I3(I) = 2
3450  REM  * POINTS OF FOR OVER OR UNDERPRICED *
3452  IF W(I) > OCPRICE(I) THEN I4(I) =  - 10
3454 II(I) = ((OCPRICE(I) - W(I)) / OCPRICE(I)) * 100
3456  IF II(I) > 0 AND II(I) <  = .75 THEN I4(I) = 1
3458  IF II(I) > .75 AND II(I) <  = 1.5 THEN I4(I) = 2
3460  IF II(I) > 1.5 AND II(I) <  = 3 THEN I4(I) = 3
3462  IF II(I) > 3 AND II(I) <  = 5 THEN I4(I) = 4
3464  IF II(I) > 5 AND II(I) <  = 7 THEN I4(I) = 5
3466  IF II(I) > 7 AND II(I) <  = 9 THEN I4(I) = 6
3468  IF II(I) > 9 AND II(I) <  = 11 THEN I4(I) = 7
3470  IF II(I) > 11 AND II(I) <  = 14 THEN I4(I) = 8
3472  IF II(I) > 14 AND II(I) <  = 18 THEN I4(I) = 9
3474  IF II(I) > 18 THEN I4(I) = 10
3480 SRT(I) = I1(I) + I2(I) + I3(I) + I4(I)
3490  RETURN
3500  REM  * PAGES *
3530  IF I = 2 THEN  GOSUB 8020
3540  IF I = 4 THEN  GOSUB 8020
3550  IF I = 6 THEN  GOSUB 8020
3560  IF I = 8 THEN  GOSUB 8020
3570  IF I = 10 THEN  GOSUB 8020
3580  IF I = 12 THEN  GOSUB 8020
3590  IF I = 14 THEN  GOSUB 8020
3600  IF I = 16 THEN  GOSUB 8020
3601  IF I = 18 THEN  GOSUB 8020
3602  IF I = 20 THEN  GOSUB 8020
3604  IF I = 22 THEN  GOSUB 8020
3606  IF I = 24 THEN  GOSUB 8020
3608  IF I = 26 THEN  GOSUB 8020
3610  IF I = 28 THEN  GOSUB 8020
4000  REM  *COMMISSION *
4010  REM ** OPTION COMMISSIONS
4030  REM ** KALL & CO.  (415) 392-0761 **
4035 NU(I) = NU(I) * 100
4036 OCPRICE = OCPRICE(I)
4040  IF OCPRICE <  = 2 AND NU(I) <  = 1000 THEN CM(I) = (NU(I) * 4) / 100
4050  IF OCPRICE <  = 2 AND NU(I) >  = 1100 AND NU(I) < 4900 THEN CM(I) = (NU(I)
 * 3) / 100
4060  IF OCPRICE <  = 2 AND NU(I) =  > 5000 THEN CM(I) = (NU(I) * 2) / 100
4070  IF OCPRICE > 2 AND OCPRICE < 8 AND NU(I) =  < 1000 THEN CM(I) = (NU(I) * 6
) / 100
4080  IF OCPRICE > 2 AND OCPRICE < 8 AND NU(I) =  > 1100 AND NU(I) <  = 4900 THE
N CM(I) = (NU(I) * 5) / 100
4090  IF OCPRICE > 2 AND OCPRICE < 8 AND NU(I) > 4900 THEN CM(I) = (NU(I) * 3) /
 100
4100  IF OCPRICE =  > 8 AND NU(I) =  < 1000 THEN CM(I) = (NU(I) * 8) / 100
4110  IF OCPRICE =  > 8 AND NU(I) > 1000 THEN CM(I) = (NU(I) * 7) / 100
4115 NU(I) = NU(I) / 100
4120  IF CM(I) < 30 THEN CM(I) = 30
4140  RETURN
4500  REM * BLACK SCHOLES CALL EVAL. **
4520  REM  * T=TIME TO EXPIRATION IN YEARS *
4530  REM * RETURNS W=OPTION VALUE *
```

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CIRCLE 295 ON READER SERVICE CARD

```
4545 VOL = VOL(I)
4560 PRICE = PRICE(I)
4570 STRIKE = STRIKE(I)
4630 T = DTE(I) / 365.25
4650  GOSUB 4670
4660  REM RETURNS W=OPTION VALUE
4670 C1 = STRIKE *  EXP ( - R * T)
4680 L =  LOG (PRICE / C1)
4690 D1 = ( LOG (PRICE / STRIKE) + (R + S ^ 2 / 2) * T) / (VOL *  SQR (T))
4700 D2 = D1 - VOL *  SQR (T)
4710 D = D1: GOSUB 4770
4720 W = PRICE * N:D = D2: GOSUB 4770
4730 W = W - C1 * N
4740  IF X > 300 THEN X = 0:FL = 1: REM *ERROR HANDLING
4750 W(X) = W
4755  RETURN
4760  REM  NEUTRAL DENSITY FUNCTION
4770 H =  ABS (D) / 24:X = 0:P = 1
4780  FOR Q = 1 TO 11
4790 X = X + H:P = P + 4 *  FN C(X)
4800 X = X + H:P = P + 2 *  FN C(X)
4810  NEXT Q
4820 X = X + H:P = P + 4 *  FN C(X)
4830 X = X + H:P = P +  FN C(X)
4840 P = P * H / 3
4850 N = P / 2.50663
4860  IF D < 0 GOTO 4880
4870 N = .5 + N: RETURN
4880 N = .5 - N: RETURN
4900  REM  * PROBABILITY CALCS. *
4910 T = VOL(I) *  SQR (T)
4920 PP =  LOG (BRVN(I) / PRICE(I))
4922 SX = PP / T
4924 Y1 = 1 / (1 + .2316419 * SX)
4926 Z = .3989423 * ( EXP ( - (SX ^ 2) / 2))
4928 N1 = Z * (1.33027 * (Y1 ^ 5) - 1.821256 * (Y1 ^ 4) + 1.781478 * (Y1 ^ 3) -
.356538 * (Y1 ^ 2) + .3193815 * Y1
     )
4940 N1(I) = (1 - N1) * 100
4941  IF DTE(I) > 270 THEN FL = 1
4942  IF VOL(I) > 1 THEN FL = 1
4950  RETURN
4952  IF DTE(I) > 270 THEN FL = 1
5000  REM ** THIS IS THE OPENING SUB **
5001  HOME
5002  VTAB 3: PRINT  TAB( 11)"* CALL WRITING *": PRINT : PRINT  TAB( 7)"SELLING
CALLS FOR PROFIT": PRINT : PRINT
5004  PRINT  TAB( 19)"BY": PRINT : PRINT  TAB( 12)"JONATHAN RICHARDS": PRINT : P
RINT  TAB( 12)"10 HOFFMAN AVENUE":
      PRINT  TAB( 5)"SAN FRANCISCO, CALIFORNIA 94114"
5005  PRINT : PRINT  TAB( 13)"COPYRIGHT 1981": PRINT : FOR XA = 1 TO 40: INVERSE
 : PRINT "=";: NEXT XA: NORMAL
5007  PR# 0
5010  VTAB 18: PRINT "FOR PROGRAM DESCRIPTION PRESS'RETURN'KEY"
5020  VTAB 20: HTAB 10: PRINT "TO LEAVE,PRESS'ESC'KEY"
5030  VTAB 22: HTAB 6: PRINT "<TO CONTINUE PRESS'SPACE BAR'>";: GET T$: PRINT :
HOME
5040  IF  ASC (T$) = 27 THEN  END
5050  IF  ASC (T$) = 13 THEN 5500
5060  IF  ASC (T$) = 32 THEN 30
5065  RETURN
5500  REM * OPENING DESCRIPTION *
5505  PRINT "    'NAKED CALL WRITING' IS A STOCK     OPTION STRATEGY  WITH  A  M
ATHEMATICALLYGOOD CHANCE OF MAKING
     A PROFIT.  THE     PROFIT OCCURS IF THE UNDERLYING STOCK    DOES NOT RISE MU
CH, STAYS THE SAME OR   DROPS IN P
     RICE BY THE";
5506  PRINT " EXPIRATION OF THE CALL."
5507  PRINT
5510  PRINT "  SHOULD THE UNDERLYING COMMON STOCK    RISE SUBSTANTIALLY, MAJOR L
OSSES COULD  RESULT.  IN FACT, YOU
     HAVE THEORETICALLYUNLIMITED POSSIBLE LOSSES AND A LIMITED GAIN.  NONETHELE
SS, THIS IS PERHAPS ONE OF THE BES
     T OPTIONS ";
5511  PRINT "STRATEGIES IF       OPTIONS PREMIUMS ARE RELATIVELY HIGH.": PRINT
5512  GOSUB 8010
5515  PRINT "  IN THIS STRATEGY YOU SELL OPTIONS ON  STOCKS YOU DO NOT OWN.  YOU
 COLLECT A   PREMIUM, AND IF THE S
     TOCK DOES NOT RISE ABOVE THE STRIKE PRICE YOU CAN KEEP THE PREMIUM."
5516  PRINT
5520  PRINT "  WITH THIS PROGRAM YOU CAN INPUT DATA  ON UP TO 30 DIFFERENT STOCK
 POSITIONS   AND THEN COMPARE EACH
     ."
5522  PRINT
5523  PRINT : PRINT "  MOST INPUT ITEMS SHOULD BE CLEAR.     VOLITATILITY IS THE
 AMOUNT A STOCK IS   EXPECTED TO F
     LUCTUATE AND CAN BE GOTTEN FROM MANY BROKERS."
5524  GOSUB 8010
5525  PRINT : PRINT "  THE FIRST SECTION OF THE OUTPUT IS A  SUMMARY OF YOUR POS
ITION.  THE SECOND   SECTION USES
     THE FAMOUS BLACK-SCHOLES   FORMULA TO HELP YOU LOCATE 'OVER-PRICED' CALLS T
O SELL. YOU DO NOT WANT TO SELL ";

5526  PRINT "'UNDER-PRICED' CALLS. THE FORMULA DOES  NOT TAKE INTO ACCOUNT DIVID
ENDS ON THE  STOCK.  IT THUS GIVES
     A CONSERVATIVE    EVALUATION; I.E. AN OVER-PRICED CALL IS TRULY OVER-PRICE
D, THEORETICALLY."
5528  GOSUB 8010
5529  PRINT "  THE THIRD SECTION COMPUTES THE PROFIT IF THE STOCK PRICE IS UNCHA
NGED AT      EXPIRATION; THIS IS T
     HE BEST COMPARISON BETWEEN SEVERAL POSTIONS.  THE % CHANCE OF MAKING MONEY
IS A STATISTICAL MEASURE";
5530  PRINT " USING THE STANDARD DEVIATION, VOLITATI-LITY, AND TIME TO EXPIRATIO
N TO COMPUTE THE STATISTICAL CHANC
     E OF THE STOCK     BEING ABOVE THE BREAKEVEN POINT BY      EXPIRATION OF TH
E OPTION."
5532  GOSUB 8010
5535  PRINT : PRINT "  THE INDEX IN THE THIRD SECTION IS AN  ARBITRARY FIGURE BA
SED ON FOUR CRITERION1. DAYS TO EX
     PIRATION, 2. % OVERVALUED, 3. PROFIT UNCHANGED, AND 4. % CHANCE OF MAKING A
 PROFIT.  THE HIGHER THE INDEX"
5537  PRINT "THE BETTER THE 'WRITE'."
5540  PRINT : PRINT "  THE LAST SECTION IS MISCELLANEOUS DATATHE COLLATERALS REQ
UIRED ARE WORTH      NOTING, AND T
     HE AMOUNT NECESSARY IN YOURACCOUNT IF THE STOCK PRICE RISES SHOULD BE AVAIL
ABLE UNLESS YOU INTEND TO SELL  EA
     RLY."
5542  PRINT : PRINT "  ABOVE ALL, PICK A STOCK THAT IS GOING TO GO DOWN IN PRICE
 !"
5555  PRINT : PRINT : PRINT : HTAB 14: PRINT "GOOD LUCK !!": NORMAL
5560  GOSUB 8010
5999  RETURN
6000  REM  ** DATE SUBROUTINE **
6010  GOSUB 6030
6020  GOTO 6090
6030  PRINT :M =  VAL ( LEFT$ (B$,2)) -  VAL ( LEFT$ (A$,2))
6040 D =  VAL ( MID$ (B$,4,2)) -  VAL ( MID$ (A$,4,2))
6050 Y =  VAL ( RIGHT$ (B$,2)) -  VAL ( RIGHT$ (A$,2))
6060  IF M < 0 THEN M = 12 + M:Y = Y - 1
6070  IF D < 0 THEN D = 30 + D:M = M - 1: IF M < 0 THEN Y = Y - 1:M = M + 12
6080  RETURN
6090 DTE(I) =  INT (D + (M * 30.41666667) + (365.25 * Y))
6110  RETURN
6260  HOME : VTAB (10): PRINT "YOU MUST ENTER THE NAME OF THE STOCK UP TO TEN LE
TTERS.  TRY AGAIN!!  ": FOR XA = 1
     TO 1300: NEXT XA: RETURN
8000  REM  *  MISC. SUBS **
8001  FOR LNE = 1 TO 40: PRINT "-";: NEXT LNE: RETURN
8002  FOR LNE = 1 TO 40: PRINT "=";: NEXT LNE: RETURN
8010  VTAB 24: PRINT  TAB( 5)"DEPRESS THE ";: INVERSE : PRINT "RETURN";: NORMAL
 : INPUT " KEY TO CONTINUE";IN$: HOME
     : RETURN
8020  FOR JO = 1 TO 12: PRINT  CHR$ (10): NEXT JO: RETURN
```

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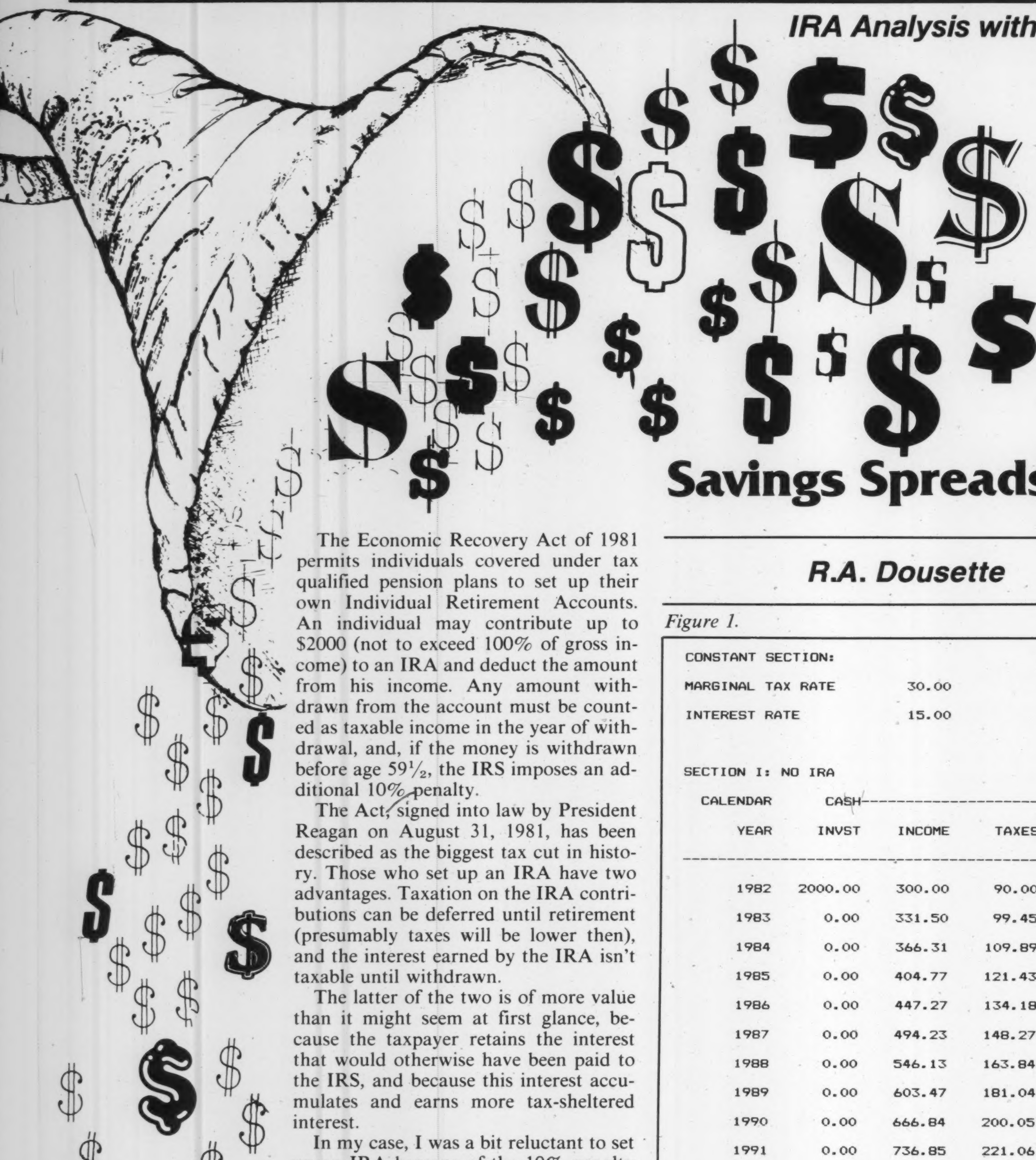
CIRCLE 161 ON READER SERVICE CARD



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R.A. Dousette

The Economic Recovery Act of 1981 permits individuals covered under tax qualified pension plans to set up their own Individual Retirement Accounts. An individual may contribute up to $2000 (not to exceed 100% of gross income) to an IRA and deduct the amount from his income. Any amount withdrawn from the account must be counted as taxable income in the year of withdrawal, and, if the money is withdrawn before age 59½, the IRS imposes an additional 10% penalty.

The Act, signed into law by President Reagan on August 31, 1981, has been described as the biggest tax cut in history. Those who set up an IRA have two advantages. Taxation on the IRA contributions can be deferred until retirement (presumably taxes will be lower then), and the interest earned by the IRA isn't taxable until withdrawn.

The latter of the two is of more value than it might seem at first glance, because the taxpayer retains the interest that would otherwise have been paid to the IRS, and because this interest accumulates and earns more tax-sheltered interest.

In my case, I was a bit reluctant to set up an IRA because of the 10% penalty on early withdrawal. I am far from age 59½ (not as far as I would like), and I wasn't sure that the tax advantages would compensate for the loss of liquidity.

What should I do? VisiCalc to the rescue. I designed a spreadsheet that predicts when the tax advantage overtakes the penalty for various combinations of interest rates and tax rates.

The spreadsheet, shown in Figure 1, is divided into three sections. The first sec-

Figure 1.

```
CONSTANT SECTION:

MARGINAL TAX RATE          30.00

INTEREST RATE              15.00


SECTION I: NO IRA

  CALENDAR      CASH------------------------------
      YEAR      INVST     INCOME      TAXES  BALANCE
---------------------------------------------------

      1982    2000.00     300.00      90.00  2210.00
      1983       0.00     331.50      99.45  2442.05
      1984       0.00     366.31     109.89  2698.47
      1985       0.00     404.77     121.43  2981.80
      1986       0.00     447.27     134.18  3294.89
      1987       0.00     494.23     148.27  3640.86
      1988       0.00     546.13     163.84  4023.15
      1989       0.00     603.47     181.04  4445.58
      1990       0.00     666.84     200.05  4912.36
      1991       0.00     736.85     221.06  5428.16
      1992       0.00     814.22     244.27  5998.12
      1993       0.00     899.72     269.92  6627.92
      1994       0.00     994.19     298.26  7323.85
      1995       0.00    1098.58     329.57  8092.86
      1996       0.00    1213.93     364.18  8942.61
      1997       0.00    1341.39     402.42  9881.58
      1998       0.00    1482.24     444.67 10919.15
      1999       0.00    1637.87     491.36 12065.66
      2000       0.00    1809.85     542.95 13332.55
      2001       0.00    1999.88     599.96 14732.47
```

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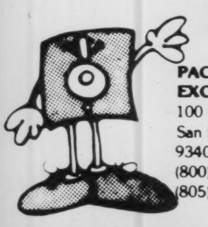

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tion assumes that no IRA is set up, and then calculates the cash available at the end of each year. Interest is earned on the principal each year based on the assumed rate, and the tax is paid at the end of the year based on the marginal tax rate.

The second section illustrates the effects of setting up an IRA. There are two funds: the tax-sheltered IRA fund in which interest isn't taxed, and a second fund in which it is. The second fund represents an accumulation of the tax savings that arise from setting up the IRA.

The third section compares the cash available at the end of each year from the first two sections.

The VisiCalc commands for creating the worksheet are shown in Figure 2. Explanations of the entries are also given.

The worksheet shows that if 15% interest can be earned, the tax advantages of the IRA exceed the 10% penalty in only five years for those in the 30% tax bracket. By entering different tax brackets it can be shown that the same five year advantage applies to those in the 40% and 50% tax brackets.

What if the average yield on investments is 12% over the next several years? Those in the 30% to 50% marginal tax range will find that the IRS comes out ahead in the sixth year; if the marginal tax rate is 20%, the IRA exceeds the 10% penalty in eight years. A further decline in yield to 8% adds about another two years to the time required for the IRA to move ahead.

It would seem, then, that for most taxpayers who can set aside some money for the next six to eight years, the 10% penalty on termination is a threat without teeth. So, if setting up an IRA in 1982 is such a good idea, why not do it again in 1983? Or in 1984?

Figure 3 shows an IRA illustration in which $2000 is invested in each of the succeeding years. This worksheet can be derived from the Figure 1 worksheet by entering the commands shown in Figure 4.

The new worksheet assumes that the taxpayer invests an amount each year that, with the prior year's tax refund, totals a $2000 contribution to the IRA. Thus, in the first section of the worksheet, the investments after 1982 are the same as the additional investment needed under the IRA.

There is no need for a fund to accumulate the tax refund in the second sec-

Figure 1, continued.

```
SECTION II: WITH IRA

CALENDAR                     TAX NON-TAXED       IRA    TAXED

    YEAR                  REFUND  INTEREST   BALANCE INTEREST        TAX   BALANCE
-----------------------------------------------------------------------------------

    1982   2000.00        600.00    300.00   2300.00     0.00       0.00    600.00
    1983      0.00          0.00    345.00   2645.00    90.00      27.00    663.00
    1984      0.00          0.00    396.75   3041.75    99.45      29.84    732.62
    1985      0.00          0.00    456.26   3498.01   109.89      32.97    809.54
    1986      0.00          0.00    524.70   4022.71   121.43      36.43    894.54
    1987      0.00          0.00    603.41   4626.12   134.18      40.25    988.47
    1988      0.00          0.00    693.92   5320.04   148.27      44.48   1092.26
    1989      0.00          0.00    798.01   6118.05   163.84      49.15   1206.94
    1990      0.00          0.00    917.71   7035.75   181.04      54.31   1333.67
    1991      0.00          0.00   1055.36   8091.12   200.05      60.02   1473.71
    1992      0.00          0.00   1213.67   9304.78   221.06      66.32   1628.45
    1993      0.00          0.00   1395.72  10700.50   244.27      73.28   1799.44
    1994      0.00          0.00   1605.08  12305.58   269.92      80.97   1988.38
    1995      0.00          0.00   1845.84  14151.41   298.26      89.48   2197.16
    1996      0.00          0.00   2122.71  16274.12   329.57      98.87   2427.86
    1997      0.00          0.00   2441.12  18715.24   364.18     109.25   2682.78
    1998      0.00          0.00   2807.29  21522.53   402.42     120.73   2964.47
    1999      0.00          0.00   3228.38  24750.91   444.67     133.40   3275.74
    2000      0.00          0.00   3712.64  28463.54   491.36     147.41   3619.70
    2001      0.00          0.00   4269.53  32733.07   542.95     162.89   3999.77
```

tion, because the tax refund is used to reduce the next IRA contribution.

In the third section, the total cash available with the IRA is equal to the IRA fund reduced by taxes and the penalty and increased by the tax refund on the last contribution.

As in the other worksheet, the number of years required for the IRA to move ahead can be determined by entering different marginal tax brackets and interest rates. For those in a 30% tax bracket, the IRA moves ahead in ten years if 12% is earned on the fund, and in eight years if 15% is earned. Those in 40% and 50% tax brackets will be ahead with an IRA in nine years if 12% interest is earned, and in seven years if 15% is earned. Those in a 20% tax bracket will have to wait ten years if they can earn 15% interest; at 12% interest, they must wait 12 years.

What about those unfortunate (or clever) enough to be in a 10% tax bracket? If the interest earned is 15%, the IRA will break even in 15 years. If interest earnings are 12%, 18 years are required to break even. If only 8% is earned over the next several years, then it will be more than 20 years before the IRA moves ahead. Obviously, the higher your taxes, the more you benefit from tax breaks.

The worksheets contain several simplifying assumptions that other users may want to modify. For example, they assume that the IRA investments are made exactly one year before the tax refund is received; in actuality, the tax refund could be received much sooner by adjusting the tax withheld from pay. Also, tax rates and interest rates can change in the future.

However adjusted, the conclusion should remain that an IRA is an excellent investment for those who can relinquish the liquidity of their assets for a few years. □

Figure 1, continued.

```
SECTION III: WITH IRA

                    ---------------------------------------------------

  CALENDAR       NO       IRA   BALANCE   NON-IRA     TOTAL       IRA

      YEAR      IRA   BALANCE    AVAIL.   BALANCE      CASH      EDGE

 ----------------------------------------------------------------------

      1982  2210.00   2300.00   1380.00    600.00   1980.00   -230.00 *

      1983  2442.05   2645.00   1587.00    663.00   2250.00   -192.05 *

      1984  2698.47   3041.75   1825.05    732.62   2557.67   -140.80 *

      1985  2981.80   3498.01   2098.81    809.54   2908.35    -73.46 *

      1986  3294.89   4022.71   2413.63    894.54   3308.17     13.28

      1987  3640.86   4626.12   2775.67    988.47   3764.14    123.28

      1988  4023.15   5320.04   3192.02   1092.26   4284.28    261.13

      1989  4445.58   6118.05   3670.83   1206.94   4877.77    432.19

      1990  4912.36   7035.75   4221.45   1333.67   5555.12    642.76

      1991  5428.16   8091.12   4854.67   1473.71   6328.38    900.22

      1992  5998.12   9304.78   5582.87   1628.45   7211.32   1213.20

      1993  6627.92  10700.50   6420.30   1799.44   8219.74   1591.81

      1994  7323.85  12305.58   7383.35   1988.38   9371.72   2047.87

      1995  8092.86  14151.41   8490.85   2197.16  10688.00   2595.15

      1996  8942.61  16274.12   9764.47   2427.86  12192.33   3249.72

      1997  9881.58  18715.24  11229.15   2682.78  13911.93   4030.35

      1998 10919.15  21522.53  12913.52   2964.47  15877.99   4958.84

      1999 12065.66  24750.91  14850.54   3275.74  18126.29   6060.63

      2000 13332.55  28463.54  17078.13   3619.70  20697.82   7365.27

      2001 14732.47  32733.07  19639.84   3999.77  23639.61   8907.14


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Figure 2.

```
/GC10
/GF$
/GOR
```

Entry of global commands for the worksheet.

```
>A1:"CONSTANT S
>B1:"ECTION:
>A2:"MARGINAL T
>B2:"AX RATE
>C2:30
>A3:"INTEREST R
>B3:"ATE
>C3:15
```

This sets up the headings and constants for the worksheet. The marginal tax rate and the interest rate are entered here. Note that the marginal tax rate is the rate that applies to the top of your income, not the rate that applies to your total income.

```
>A5:"SECTION I:
>B5:" NO IRA
>A6:/FR"CALENDAR
>B6:/FR"CASH
>C6:/--
>C6:/R:D6.E6
>A7:/FR"YEAR
>B7:/FR"INVST
>C7:/FR"INCOME
>D7:/FR"TAXES
>E7:/FR"BALANCE
>A8:/--
/A8:/R:B8.E8
```

Headings for Section I.

```
>A9:/FI1982
>A10:/FI1+A9
>A10:/R:A11.A28:R
```

Entry of the calendar year for each row.

```
>B9:2000
>B10:0
>B11:+B10
>B11:/R:B12.B28:R
```

Entry of the amount to be invested each year at the beginning of the year. For the first worksheet, an investment is made in the first year only.

```
>C9:+C3*(B9+E8)/100
>C9:/R:C10.C28:NRR
```

Interest earned during the year. The interest is earned on the balance at the end of the prior year and the amount invested in this year.

```
>D9:+C2*C9/100
>D9:/R:D10.D28:NR
```

The income tax due at the end of the year is equal to the marginal tax rate applied to the interest earned during the year.

```
>E9:+E8+B9+C9-D9
>E9:/R:E10.E28:RRRR
```

The fund balance at the end of the year is equal to the fund balance at the end of the previous year increased by interest earned and any additional investment that year, and decreased by taxes.

```
>A32:"SECTION II
>B32:": WITH IRA
```

Headings for Section II

Figure 2, continued.,

```
>A34:/FR"CALENDAR
>C34:/FR"TAX
>D34:/FR"NON-TAXED
>E34:/FR"IRA
>F34:/FR"TAXED
>A35:/FR"YEAR
>C35:/FR"REFUND
>D35:/FR"INTEREST
>E35:/FR:"BALANCE
>F35:/FR"INTEREST
>G35:/FR"TAX
>H35:/FR"BALANCE
>A36:/--
>A36:/R:B36.H36
```

```
>A37:/FI1982
>A38:1+A37
>A38:/FI/R:A39.A56:R
```

Entry of the calendar year of each row.

```
>B37:2000
>B38:0
>B39:+B38
>B39:/R:B40.B56:R
```

Entry of the IRA investment. The investment is made at the beginning of each year. For the first worksheet, an investment is made in the first year only.

```
>C37:+B37*C2/100
>C37:/R:C38.C56:RN
```

Tax refund. Equal to IRA investment multiplied by the marginal tax rate.

```
>D37:+B37*C3/100
>D38:+E37+B38*C3/100
>D38:/R:D39.D56:RRN
```

Tax sheltered interest. Equal to interest on the IRA balance at the end of the previous year and the investment during the year.

```
>E37:+B37+D37
>E38:+E37+B38+D38
>E38:/R:E39.E56:RRR
```

Balance in the IRA. Equal to the previous IRA balance plus additional investment during the year plus interest earned during the year.

```
>F37:0
>F38:+H37+C38*C3/100
>F38:/R:F39.F56:RRN
```

Interest on the taxed fund. This fund is the accumulation of the tax refund that resulted from setting up the IRA.

```
>G37:+C2*F37/100
>G37:/R:G38.G56:NR
```

Tax on the interest earned on the tax refund.

```
>H37:+C37+F37-G37
>H38:+H37+C38+F38-G38
>H38:/R:H39.H56:RRRR
```

Balance at the end of the year. This column contains the accumulation of the tax refund at interest and after taxes.

```
>A68:"SECTION II
>B68:"I:
>C69:/FR:"WITH
>D69:" IRA
>C70:/--
>C70:/R:D70.F70
>A71:/FR:"CALENDAR
>B71:/FR"NO
>C71:/FR"IRA
>D71:/FR"BALANCE
>E71:/FR"NON-IRA
>F71:/FR"TOTAL
```

Headings for Section III.

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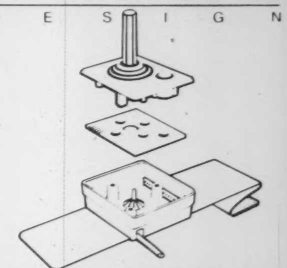

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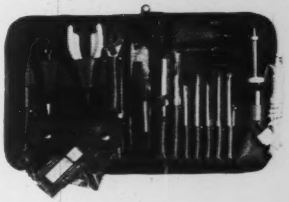

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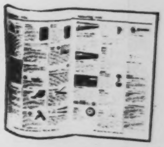

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Figure 2, continued.

```
>G71:/FR"IRA
>A72:/FR"YEAR
>B72:/FR"IRA
>C72:/FR"BALANCE
>D72/FR"AVAIL.
>E72:/FR"BALANCE
>F72:/FR"CASH
>G72:/FR"EDGE
>A73:/--
>A73:/R:B73.G73
```

```
>A74:/FI1982
>A75:/FI1+A74
>A75:/R:A76.A93:R
```

Entry of the calendar year of each row.

```
>B74:+E9
>B74:/R:B75.B93:R
```

Fund balance if no IRA is set up.

```
>C74:+E37
>C74:/R:C75.C93:R

>D74:+90-C2*C74/100
>D74:/R:D75.D93:NR

>E74:+H37
>E74:/R:E75.E93:R

>F74:+D74+E74
>F74:/R:F75.F93:RR

>G74:+F74-B74
>G74:/R:G75.G93:RR

>H74:/F*@IF(G74>0,0,1)
>H74:/R:H75.H93:R
```

Figure 3.

```
CONSTANT SECTION:

MARGINAL TAX RATE       30.00

INTEREST RATE           15.00


SECTION I: NO IRA                                         SECTION II: WITH IRA

  CALENDAR     CASH------------------------------           CALENDAR                  TAX NON-TAXED       IRA

      YEAR     INVST     INCOME     TAXES   BALANCE             YEAR               REFUND  INTEREST   BALANCE
-------------------------------------------------         ------------------------------------------------
      1982   2000.00     300.00     90.00   2210.00             1982   2000.00     600.00    300.00   2300.00
      1983   1400.00     541.50    162.45   3989.05             1983   1400.00     600.00    645.00   4945.00
      1984   1400.00     808.36    242.51   5954.90             1984   1400.00     600.00   1041.75   7986.75
      1985   1400.00    1103.24    330.97   8127.16             1985   1400.00     600.00   1498.01  11484.76
      1986   1400.00    1429.07    428.72  10527.52             1986   1400.00     600.00   2022.71  15507.48
      1987   1400.00    1789.13    536.74  13179.91             1987   1400.00     600.00   2626.12  20133.60
      1988   1400.00    2186.99    656.10  16110.80             1988   1400.00     600.00   3320.04  25453.64
      1989   1400.00    2626.62    787.99  19349.43             1989   1400.00     600.00   4118.05  31571.68
      1990   1400.00    3112.41    933.72  22928.12             1990   1400.00     600.00   5035.75  38607.44
      1991   1400.00    3649.22   1094.77  26882.57             1991   1400.00     600.00   6091.12  46698.55
      1992   1400.00    4242.39   1272.72  31252.24             1992   1400.00     600.00   7304.78  56003.33
      1993   1400.00    4897.84   1469.35  36080.73             1993   1400.00     600.00   8700.50  66703.83
      1994   1400.00    5622.11   1686.63  41416.21             1994   1400.00     600.00  10305.58  79009.41
      1995   1400.00    6422.43   1926.73  47311.91             1995   1400.00     600.00  12151.41  93160.82
      1996   1400.00    7306.79   2192.04  53826.66             1996   1400.00     600.00  14274.12 109434.94
      1997   1400.00    8284.00   2485.20  61025.46             1997   1400.00     600.00  16715.24 128150.19
      1998   1400.00    9363.82   2809.15  68980.13             1998   1400.00     600.00  19522.53 149672.71
      1999   1400.00   10557.02   3167.11  77770.04             1999   1400.00     600.00  22750.91 174423.62
      2000   1400.00   11875.51   3562.65  87482.90             2000   1400.00     600.00  26463.54 202887.17
      2001   1400.00   13332.43   3999.73  98215.60             2001   1400.00     600.00  30733.07 235620.24
```

Balance in the IRA if the IRA is set up.

IRA balance available. After taxes and the 10% penalty have been paid.

Accumulated value of IRA generated tax refunds.

Total cash available if IRA has been set up. Equal to IRA balance plus tax refund accumulation.

Excess of IRA over amount if no IRA is set up.

An * indicates that the IRA is behind in this year.

```
>E95:/FI@SUM(H74.H93)+1

>F95:" YEARS TO

>G95:"BREAK EVEN

>E96:@CHOOSE(E95,A74.A93)

>F96:" IS THE YE

>G96:"AR WHEN TH

>H96:"E IRA

>F97:" MOVES AHE

>G97:"AD.
```

```
SECTION III: WITH IRA

                  ---------------------------------------------------
  CALENDAR        NO       IRA   BALANCE        TAX     TOTAL        IRA

      YEAR       IRA   BALANCE    AVAIL.    BALANCE      CASH       EDGE
----------------------------------------------------------------------

      1982   2210.00   2300.00   1380.00     600.00   1980.00    -230.00 *
      1983   3989.05   4945.00   2967.00     600.00   3567.00    -422.05 *
      1984   5954.90   7986.75   4792.05     600.00   5392.05    -562.85 *
      1985   8127.16  11484.76   6890.86     600.00   7490.86    -636.31 *
      1986  10527.52  15507.48   9304.49     600.00   9904.49    -623.03 *
      1987  13179.91  20133.60  12080.16     600.00  12680.16    -499.75 *
      1988  16110.80  25453.64  15272.18     600.00  15872.18    -238.61 *
      1989  19349.43  31571.68  18943.01     600.00  19543.01     193.58
      1990  22928.12  38607.44  23164.46     600.00  23764.46     836.34
      1991  26882.57  46698.55  28019.13     600.00  28619.13    1736.56
      1992  31252.24  56003.33  33602.00     600.00  34202.00    2949.76
      1993  36080.73  66703.83  40022.30     600.00  40622.30    4541.57
      1994  41416.21  79009.41  47405.65     600.00  48005.65    6589.44
      1995  47311.91  93160.82  55896.49     600.00  56496.49    9184.59
      1996  53826.66 109434.94  65660.97     600.00  66260.97   12434.31
      1997  61025.46 128150.19  76890.11     600.00  77490.11   16464.66
      1998  68980.13 149672.71  89803.63     600.00  90403.63   21423.50
      1999  77770.04 174423.62 104654.17     600.00 105254.17   27484.13
      2000  87482.90 202887.17 121732.30     600.00 122332.30   34849.40
      2001  98215.60 235620.24 141372.14     600.00 141972.14   43756.54

                                          8 YEARS TO BREAK EVEN

                                    1989 IS THE YEAR WHEN THE IRA

                                            MOVES AHEAD.
```

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IRA Analysis, continued...

Figure 4.

`>B10:100-C2*B9/100`	The non-IRA investment must equal the additional cash investment under the IRA. This is necessary for the two investment programs to be comparable.
`>B38:2000-C37` `>B38:/R:B39.B56:R`	The $2000 investment is offset by the prior tax refund to give the additional investment required.
`>C38:+B38+C37*C2/100` `>C38:/R:C39.C56:RRN`	The tax refund is calculated on the total of the additional investment and the prior tax refund.
`>D38:+E37+B38+C37*C3/100` `>D38:/R:D39.D56:RRRN`	The interest is calculated on the prior IRA balance plus the additional investment.
`>E38:+E37+B38+C37+D38` `>E38:/R:E39.E56:RRRR`	The IRA balance is equal to the prior balance increased by the additional investment and interest.

`>F33:/R:F34.F56`
`>G33:/R:G34.G56`
`>H34:/R:H35.H56`
`>E71:"TAX`
`>E72:"REFUND`
	These columns are no longer needed.

`>E74:+C37` `>E74:/R:E75.E93:R`	Transfer tax refund from Section II into this column.

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Part 2: Mesh Plots and Hidden Line Removal

STEREO GRAPHICS

John D. Fowler, Jr.

Last month's discussion on creating lifelike images with plausible depth will be extended in this installment to include plotting of mathematical functions of two variables with removal of hidden lines. I hope you still have the viewer described in the first part of this series. You will need it to capture the sense of depth inherent in the stereo images shown on these pages. Most of the definitions and concepts introduced in the first part will also apply here.

The plots which accompany this article are two-dimensional projections of three-dimensional graphs of functions of two variables. A function of two variables may be written as:

$y=f(x,z)$.

The dependent variable y is uniquely determined by some mathematical combination of terms involving the independent variables x and z. For each value of x and z, the functional relationship returns a single value of y, the value of the function. Some examples of two-variable functions will be given later in this article.

The presence of a three-variable (y, x, and z) relationship creates a serendipitous correspondence with the three dimensions of our real world. If we let pairs of values for x and z represent points on a flat surface, the functional values of y can represent the height above the plane over the points (x,z). If we take regularly-spaced values of x and z in order to form a square grid on the flat surface, the corresponding values of y will form a set of points above or below this grid. Connecting neighboring values of y along lines of equal x and equal z gives us a net-like graphic approximation of the function. Such a graph is called a mesh plot.

A mesh plot of a pyramid-like function is shown in Figure 1. The figure is a projection onto the page of an object (the three-dimensional graph of the function), plotted from a particular viewing point. If it were plotted from directly above (or below) and with a large enough viewer-to-object distance to prevent perspective distortion, the square mesh projection onto the X-Z plane would be apparent.

One source of confusion in viewing plots of this type is the presence of line segments which, had this been a real solid, would be hidden from the viewer. Removal of these hidden lines renders the object more readily recognizable and, in the case of mimicking real objects in stereo, enhances the illusion. Figure 2 is a plot of the function in Figure 1, but with hidden lines removed.

Hidden Line Removal

Removal of hidden lines (or surfaces for solid objects) has occupied the attention of workers in the field of computer graphics for almost as long as computers have been drawing figures. Specific methods have been discovered which work efficiently for particular types of plots, but will not function properly for others. Several methods will be outlined here.

Direct coding. Given a particular object with a specific orientation and viewer position, the programmer can hand-code the program to plot only those lines which will be visible. This can be done by calculating the end points of visible line segments prior to writing the program. This method, of course, is very specific and useless for displaying objects in more general situations.

Plotting from the front using a memory map. This takes a lot of memory but allows a more general solution to plotting multiple objects with hidden lines removed. The amount of memory needed depends on the display resolution. One bit is required for each picture element (pixel) of the display. For a 1K display (2^{10} x 2^{10} bits) 2^{20} bits or 128K bytes of memory must be dedicated to plotting. There exist today personal computers with this much memory, and they will be commonplace in the near future.

The procedure is as follows. Clear (zero) the memory map. Assign a bit in the map to each point on the display. Start at the front of the nearest object to be plotted and calculate, point by point, the display elements to be plotted. Check the map, and if the bit corresponding to a given point contains a zero, set the bit to 1 and plot the point. If the bit already contains a 1, the point is hidden and should not be plotted. After the nearest object has been plotted, continue with the second-nearest object, and so on.

John D. Fowler, Jr., 946 Capulin, Los Alamos, NM 87544.

Overlapping objects, for which parts of object 1 are both closer and further away than object 2, can be tricky.

Plotting from the front and maintaining a perimeter list. For certain types of objects, remembering every visible point is unnecessary, thus allowing the use of considerably less memory. This class of objects consists of those for which any thin vertical slice through the object is filled from a single bottom perimeter point to a single top point. Objects with holes or non-vertical projections do not qualify. Mesh plots are acceptable, as long as they are not rotated with respect to the horizon. For our purposes, this means that the mesh plots can not be rotated about the Z axis.

The procedure for plotting these objects is to start from the front and work back, always keeping a record in memory of the perimeter of the portion of the object which has already been drawn. Each point under consideration for plotting must be compared to the current perimeter. If it lies outside the perimeter, then the perimeter is extended to include the point, and it is plotted. If the point lies insides the perimeter, it is hidden and not plotted. The perimeter can be kept in two vector variables of dimension XRES, which is the number of resolvable points along a horizontal line on the display. One vector can contain the top half of the perimeter, and the other vector the bottom half.

This is the procedure which we shall use in our program for generating mesh plots. Notice the intimate connection between the variable dimensions and magnitudes and the display resolution. Since XRES and YRES will be a few thousand at the most, we can use 2-byte integers for most of the variables in our program. This will yield a substantial saving in memory.

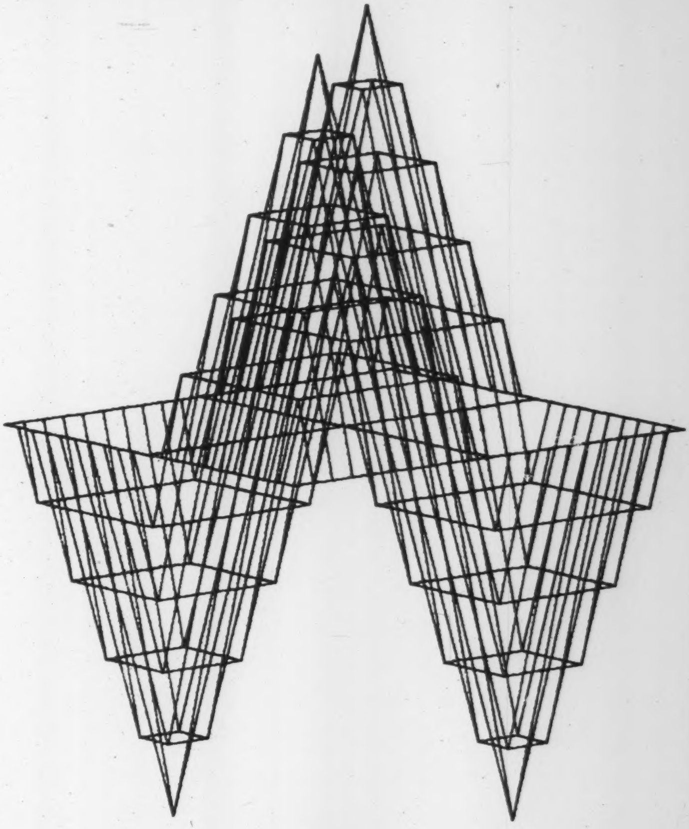


Figure 1.

Other Features

Some of the features of the program, in addition to hidden line removal, include:

- Arbitrary rotation of the function from 0 to 360° about the Y axis, followed by arbitrary rotation about the X axis.
- Arbitrary viewer position (x,y,z) and plotting resolutions (XRES,YRES).
- Color coding of the function in the Y-direction according to the value of the function (See Figures 2, 3, 5, and 6).
- Using a different color for the bottom side of the mesh (Figures 4 and 5).
- Drawing single frames or stereo pairs.

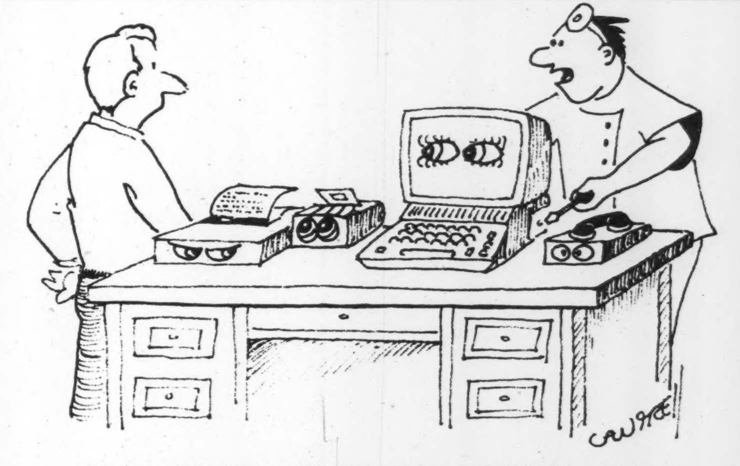
The program is shown in Listing 1. The function to be plotted, which is written in the form:

P=f(K,L)

goes in the subroutine starting at Line 4000. This subroutine always terminates by scaling the function as follows:

P=P*YRES/(3*TX*FR),

followed by a RETURN statement. The function is usually written so that the origin occurs where K and L both equal D/2. D is the number of lines along one side of the mesh.



"It seems to be in pretty good shape, and it has excellent *peripheral vision."*

Listing 1.

```
10 CF=3.141593/180
20 DIM V1(12)
30 INPUT "MIN FOR PEN 1";V1(1)
40 FOR I=2 TO 12
50 PRINT "MAX FOR PEN" I-1;:INPUT V1(I)
60 NEXT I
70 INPUT "1 FRAME OR 2";FX
80 FX=ABS(FX-2)
90 INPUT "NUMBER OF LINES";D
100 D=D-1
110 INPUT "XRES,YRES";XRES,YRES
120 DIM H(XRES),L(XRES),ML(D),NL(D)
130 FR=(FX+1)*.3*XRES/D
140 INPUT "PHI,THETA,VIEWER DISTANCE";PH,TH,Z
150 INPUT "MAX ABS OF FN";TX
160 OC=INT(PH/45)+1
170 I1=0:I2=D:I3=1:J1=0:J2=D:J3=1:FI=1:FJ=0
180 ON OC GOTO 190,190,200,210,220,220,210,200
190 J1=D:J2=0:J3=-1:I1=D:I2=0:I3=-1:GOTO 220
200 I1=D:I2=0:I3=-1:GOTO 220
210 J1=D:J2=0:J3=-1
220 IF OC=2 OR OC=3 OR OC=6 OR OC=7 THEN 240
230 FI=0:FJ=1
240 X=-XRES/30:W=YRES/2:Y=0
250 IF FX=1 THEN X=0
260 CT=COS(CF*TH):ST=SIN(CF*TH)
270 CP=COS(CF*PH):SP=SIN(CF*PH)
280 Q=(FX+1)*XRES/4
290 FOR I=0 TO XRES:H(I)=0:L(I)=YRES:NEXT I
300 FOR I=I1 TO I2 STEP I3
310 GOSUB 850
320 FOR J=J1 TO J2 STEP J3
330 K=I*FI+J*FJ
340 L=J*FI+I*FJ
350 GOSUB 4000
360 HF=0
370 IF ML(J)>=0 THEN 410
380 ML(J)=-ML(J)
390 IF HOLD=0 THEN MF=1
400 GOTO 420
410 MF=0
420 M=ML(J)
430 N=NL(J)
440 IF MF=1 OR J=J1 THEN 810
450 IF M=MOLD THEN MOLD=MOLD+1
460 DX=(M-MOLD)/ABS(M-MOLD)
470 DY=(N-NOLD)/ABS(M-MOLD)
480 MX=MOLD:NX=NOLD
490 FOR IN=MOLD TO M STEP DX
500 IF IN=MOLD AND HOLD=1 THEN 590
510 IF NX<H(IN) THEN 560
520 H(IN)=NX
530 P2=1
540 IF L(IN)=YRES THEN L(IN)=
    INT(NX-1)
550 GOTO 590
560 IF NX>L(IN) THEN 610
570 P2=0
580 L(IN)=NX
590 IF HF=1 THEN 700
600 M1=IN:N1=NX:HF=1:GOTO 700
610 IF HF=0 THEN 700
620 HF=0:M2=IN:N2=NX
630 PN=2
640 IF P2=1 THEN PN=3
650 IF I/D=INT(I/D) THEN PN=1
660 IF PN>2 THEN 690
670 CALL DRAW (M1,N1,M2,N2)
680 GOTO 700
690 GOSUB 3000
700 MX=MX+DX:NX=NX+DY
710 NEXT IN
720 IF HF=0 THEN 810
730 PN=2
740 IF P2=1 THEN PN=3
750 IF I/D=INT(I/D) THEN PN=1
760 IF PN>2 THEN 790
770 CALL DRAW (M1,N1,M,N)
780 GOTO 810
790 M2=M:N2=N
800 GOSUB 3000
```

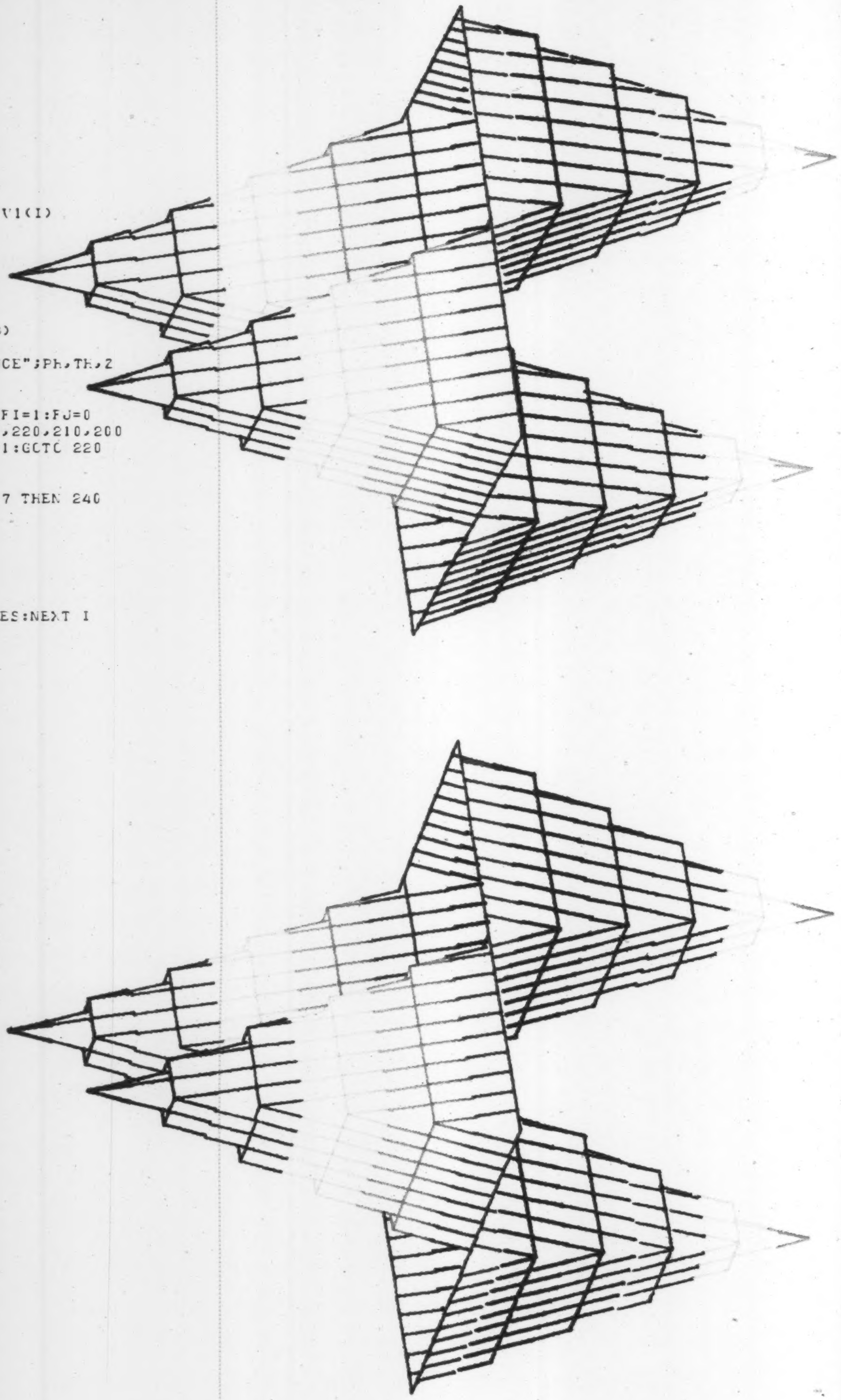


Figure 2.

```
810 MOLD=M:NOLD=N:HCLD=HF
820 PL=P
830 NEXT J:NEXT I
840 GOTO 1240
850 FOR K1=J1 TO J2 STEP J3
860 K=(I-I3)*FI+K1*FJ
870 L=K1*FI+(I-I3)*FJ
880 GOSUB 4000
890 PL=P
900 K=I*FI+K1*FJ
910 L=K1*FI+I*FJ
920 GOSUB 2000
930 IF I=I1 THEN 1210
940 IF N>H(M) OR N<L(M) THEN 970
950 ML(K1)=-M:NL(K1)=N
960 GOTO 1220
970 MOLD=ML(K1)
980 NOLD=NL(K1)
990 IF M=MOLD THEN MOLD=MOLD+1
1000 DY=(NOLD-N)/ABS(M-MOLD)
1010 DX=(MOLD-M)/ABS(M-MOLD)
1020 ID=0
1030 ID=ID+1
1040 M1=M+ID*DX
1050 N1=INT(N+ID*DY)
1060 IF N1<=H(M1) AND N1>=L(M1) THEN 1110
1070 IF N1>H(M1) THEN H(M1)=N1
1080 IF N1<L(M1) THEN L(M1)=N1
1090 IF M1=MOLD THEN 1130
1100 GOTO 1030
1110 IF N>H(M) THEN N1=H(M1)
1120 IF N<L(M) THEN N1=L(M1)
1130 PN=2
1140 IF N>H(M) THEN PN=3
1150 IF K1/D=INT(K1/D) THEN PN=1
1160 IF PN>2 THEN 1190
1170 CALL DRAW (M1,N1,M,N)
1180 GOTO 1210
1190 M2=M:N2=N
1200 GOSUB 3000
1210 ML(K1)=M:NL(K1)=N
1220 NEXT K1
1230 RETURN
1240 IF Q=XRES/2 THEN END
1250 IF Q=3*XRES/4 THEN END
1260 Q=3*XRES/4:X=-X:GOTO 290
2000 GOSUB 4000
2010 A=(K-D/2)*CP-(L-D/2)*SP
2020 B=P
2030 C=(L-D/2)*CP+(K-D/2)*SP
2040 B=B*CT-C*ST
2050 C=C*CT+P*ST
2060 CZ=C/(Z-C)
2070 M=INT((A+(A-X)*CZ)*FR+Q)
2080 N=INT((B+(B-Y)*CZ)*FR+W)
2090 RETURN
3000 P8=P*TX*FR*3/YRES:P7=PL*TX*FR*3/YRES
3010 IF MOLD=M1 THEN 3030
3020 P7=P7+(M1-MOLD)*(P8-P7)/(M-MOLD)
3030 IF M2=M THEN 3050
3040 P8=P7+(M2-M1)*(P8-P7)/(M-M1)
3050 C4=SGN(P8-P7)
3060 C3=0
3070 IF C4=1 THEN C3=1
3080 FOR I5=1 TO 12
3090 IF P7>V1(I5) THEN C1=I5
3100 IF P8>V1(I5) THEN C2=I5
3110 NEXT I5
3120 M4=M1:N4=N1
3130 PN=C1
3140 IF C1<>C2 THEN 3180
3150 M3=M2
3160 N3=N2
3170 GOTO 3200
3180 M3=M1+(M2-M1)*(V1(C1+C3)-P7)/(P8-P7)
3190 N3=N1+(N2-N1)*(V1(C1+C3)-P7)/(P8-P7)
3200 CALL DRAW (M4,N4,M3,N3)
3210 M4=M3:N4=N3
3220 IF C1=C2 THEN 3250
3230 C1=C1+C4
3240 GOTO 3130
3250 RETURN
4000 R=(K-D/2)^2+(L-D/2)^2
4010 P=2.3*EXP(-3*R/D)-.2*COS(50*R*CF/D)
4020 P=P*YRES/(3*TX*FR)
4030 RETURN
```

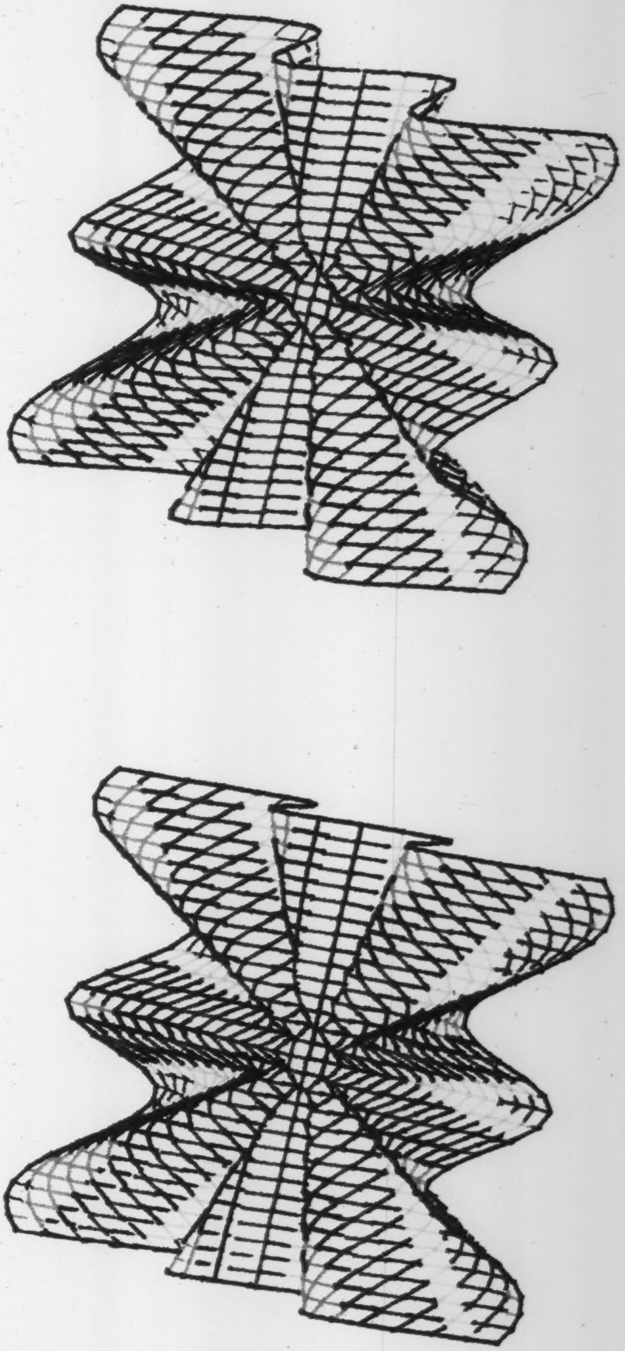


Figure 3.

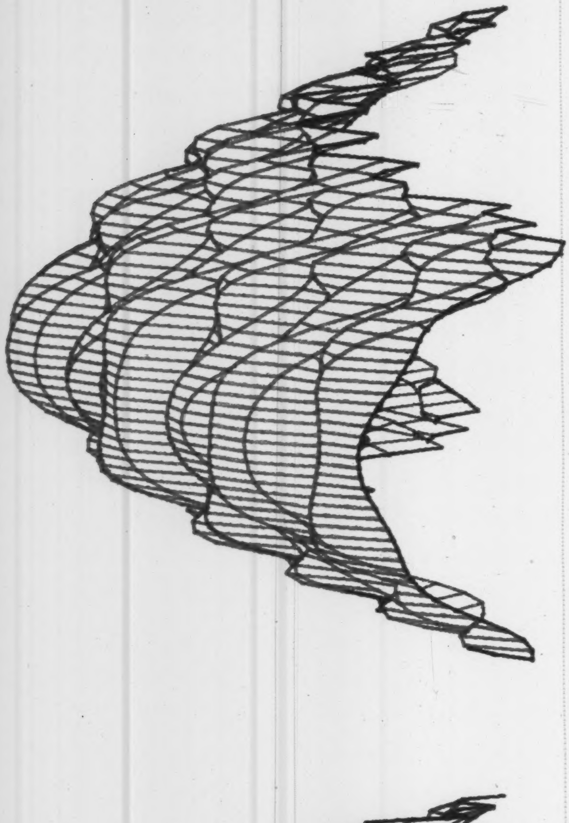


Figure 4.

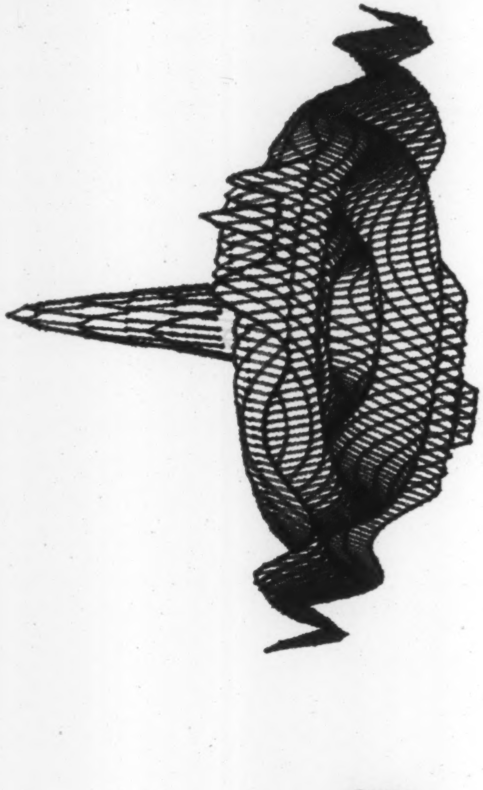


Figure 5.

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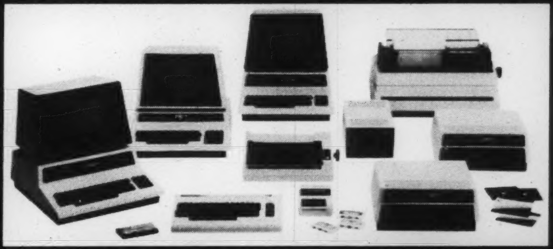

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Stereo Graphics, continued...

Color coding the height of the function is accomplished by assigning maximum values for given colors (pens) to the vector V1. This is done in lines 40 through 60 and used in lines 3080 through 3110. The program as listed provides for 12 colors. This number can be altered by changing lines 20, 40, and 3080.

Variables FR and TX serve the purpose of scaling the plot so that it will fit properly on the display. In particular, TX is intended to be the maximum of the absolute value of the function over the plotting range, but it can also be used as a vertical scaling factor by setting it larger or smaller. The program assumes that the display coordinate (0,0) defines the lower left corner of the display. The variables Q and W then define, respectively, the horizontal and vertical displacements necessary to move the origin to the center of the display.

Since the program must always draw from the front, some calculations are required to set loop indices based on the viewing angles PH and TH. Lines 160 through 230 set the indices properly so that plotting will always begin at the nearest corner of the mesh. Sines and cosines of the angles are calculated in lines 260 and 270.

The perimeter vectors H (for high side) and L (for low side) are initialized in line 290. These two vectors test the visibility of a point in the following ways: For any point (M,N) on the display, if N is greater than H(M) or if N is less than L(M), the point is visible; otherwise, it is hidden. If the point is visible, the perimeter must be altered by setting either H(M) (if above) or L(M) (if below) to N. Note that the variable M must be an integer, since it is used as a subscript in the perimeter vectors.

The main part of the program begins at line 200. There are five subroutines which perform the functions discussed below. The subroutine at line 2000 calculates the display coordinates (M,N) for mesh points. For a more detailed description of this subroutine, see Part 1 of this series in the January 1983 issue of *Creative Computing.*

The subroutine at line 3000 does the vertical color coding of the function, using ten variables as input: the starting point of the line (MOLD, NOLD); the end point (M,N); the first visible point (M1,N1); the last visible point (M2, N2); and the starting and ending values of the functions, PL and P. The subroutine calculates pen-changing points and calls the plotting subroutine.

The subroutine at line 4000 defines the function P(K,L).

You will have to write your own plotting subroutine, since it will be specific to your system. This will be easy to do,

Table 1. Functions Used in the Figures.

Figures 1 and 2.

```
4000 IF K>D/2 THEN KK=K-D/2 ELSE KK=K
4010 IF L>D/2 THEN LL=L-D/2 ELSE LL=L
4020 T1=D/4-ABS(D/4-KK)
4030 T2=D/4-ABS(D/4-LL)
4040 IF T1<T2 THEN P=T1 ELSE P=T2
4050 IF K>D/2 AND L>D/2 THEN 4080
4060 IF K<D/2 AND L<D/2 THEN 4080
4070 P=-P
4080 P=P*YRES/(3*TX*FR)
4090 RETURN
```

Figure 3.

```
4000 R=(K-D/2)^2+(L-D/2)^2
4010 P=2.3*SIN(-3*CF*R/D)-.2*COS(50*CF*R/D)*SIN(77*CF*L)+.3
4020 P=P*YRES/(3*TX*FR)
4030 RETURN
```

Figure 4.

```
4000 R=SQR((K-D/2)^2+(L-D/2)^2)
4010 IF L-D/2=0 THEN 4060
4020 T7=ATN((K-D/2)/(L-D/2))
4030 IF L>D/2 THEN T7=T7+3.1415963
4040 P=SIN(T7*9)*R
4050 GOTO 4070
4060 P=-SGN(K-D/2)*R
4070 P=P*YRES/(3*TX*FR)
4080 RETURN
```

Figure 5.

```
4000 R=(K-D/2)^2+(L-D/2)^2
4010 P=2.3*EXP(-3*R/D)-.2*COS(50*R*CF/D)
4020 P=P*YRES/(3*TX*FR)
4030 RETURN
```

Figure 6.

```
4000 R=.5154*(K-19.22)^2+2.174*(L-27.4)^2
4010 P=2.858*EXP(-R/D)
4020 R=1.441*(K-5.549)^2+1.179*(L-2.312)^2
4030 P=P-1.869*EXP(-R/D)
4040 R=2.97*(K-27.09)^2+1.16*(L-23.97)^2
4050 P=P+.89*EXP(-R/D)
4060 R=1.647*(K-22.45)^2+.1782*(L-2.221)^2
4070 P=P+2.669*EXP(-R/D)
4080 R=2.393*(K-.4131)^2+2.862*(L-28.21)^2
4090 P=P-1.927*EXP(-R/D)
4100 P=P*YRES/(3*TX*FR)
4110 RETURN
```

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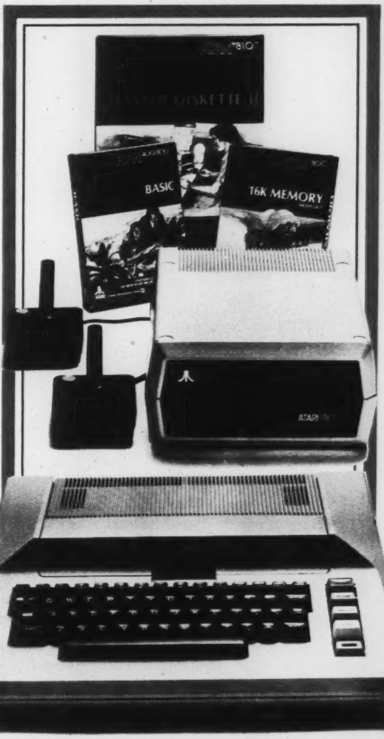

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however. The reference CALL DRAW (A,B,C,D) appears in the listing at lines 670, 770, 1170, and 3200. You must replace these lines with calls to a subroutine which draws a straight line from the point (A,B) to the point (C,D) using the color specified by the variable PN.

In drawing the mesh, the program distinguishes between two types of lines, almost-horizontal and almost-vertical (called h and v below). These directions are referenced to the horizontal and vertical axes of the display. A line which lies in a direction closer to the horizontal than the vertical axis is an h-line.

The subroutine from line 850 to line 1230 calculates the mesh points and determines the visibility of v-line segments connecting the current h-line to the next. Visible segments are plotted. Display coordinates (M,N) for the next h-line are saved in the vectors ML and NL. If a point is not visible, the vector component of ML for that point is set to its negative. This information will be used in the next part of the program.

The portion of the program from lines 300 through 830 handles the h-line segments. If both the last and current components of ML are negative, then the entire line segment is assumed to be hidden. Otherwise, the loop in lines 490 through 710 is executed to test for visible portions of the h-line segment.

When stereo images are drawn, the image intended for the left eye is drawn on the left side of the frame.

The functions which were used in drawing the figures are listed in Table 1. These should give you some good ideas in making up your own. The parameters for the function of Figure 6 were selected with the RND (random) function, so you might say that the computer did the whole thing. For further ideas on functions to plot, consult Melvin L. Prueitt's *Computer Graphics* (Dover Books, 1975).

The decision as to whether the bottom side of the mesh or the top side is being plotted, is made in lines 640, 740, and 1140. The pen color number, PN, equals 2 if plotting is on the underside; otherwise, PN equals 3.

Lines 650, 750, and 1150 will switch PN to 1 whenever the line number being plotted is exactly divisible by D. This is what colors the border of the mesh with the color corresponding to a PN of 1. To use color number 1 on, for instance, every fifth line, change D to 5 in lines 650, 750, and 1150.

If PN is greater than the number specified in line 660, 760, or 1160, the color-coding subroutine at line 3000 will be called. To color-code the whole mesh, set this number to zero. To color-code just the top side, the number should be 2, as in the listing. If the number is set to 3 or more, no color-coding of the vertical direction will occur.

The foregoing offers a very incomplete sketch of how the program works. The best way to learn about it is to use it. Observe what happens as the picture is being drawn. Try to change it. Make up some functions of your own. Most of all, I hope you have fun. □

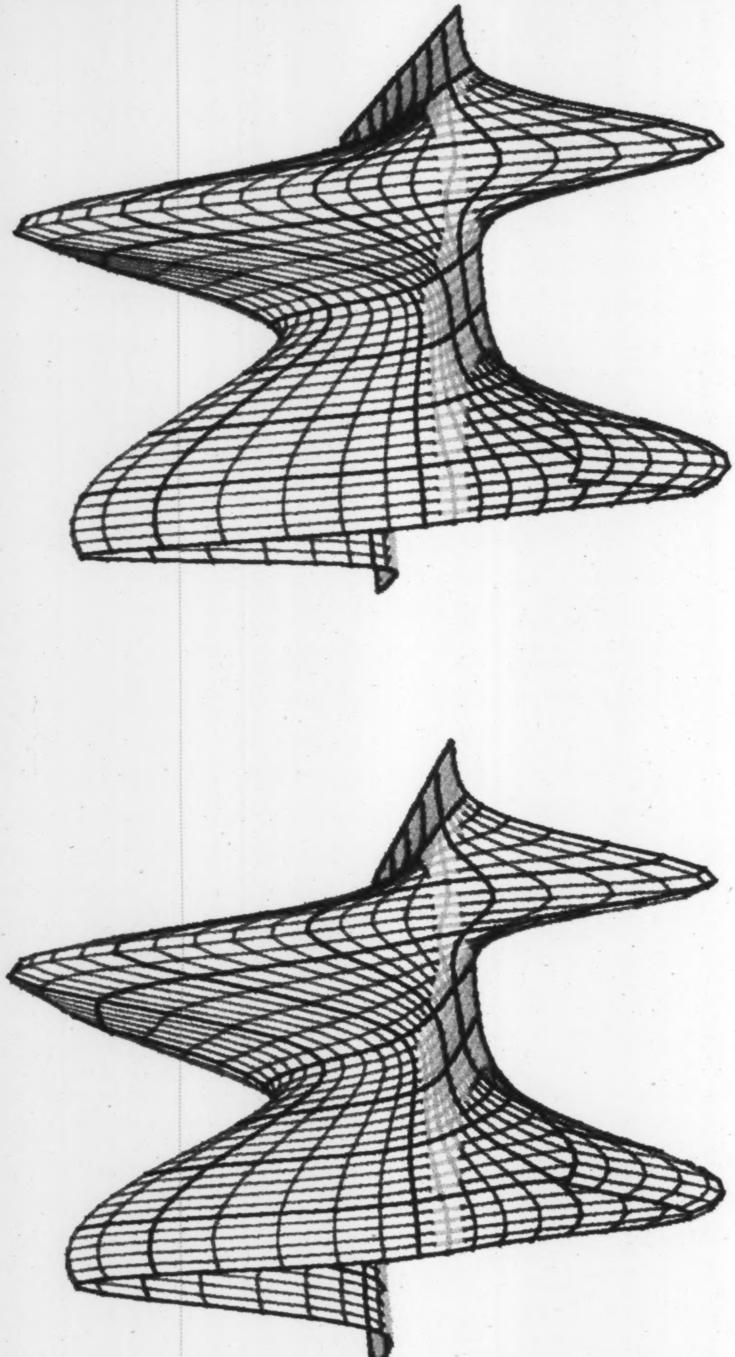

Figure 6.

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Part 8: A Bit of a Shift

The Graph Paper

David Lubar

Let me open with a short story. A year or two ago, I was convinced that there was some standard set of graphics routines along the lines of those in ROM, and that these routines were used by all the top programmers. It was a natural enough assumption, since many early programs did use some version of the hi-res routines supplied by Apple in the demo tapes. I was sure some "souped up" version of these was making the rounds.

Bob Bishop was kind enough to straighten me out, explaining that there were no standard routines. Indeed, many programmers created specialized routines for each new game. The key to these routines is the concept of pre-shifted shapes.

After learning of this, I procrastinated for a while, afraid that the task of coding such concepts would be enormous. Finally, I gave it a shot, and was pleasantly surprised to learn that a plotting routine for pre-shifted shapes is both simple and short. Before presenting the code, however, I want to go over the ideas behind shifting shapes.

Unlucky Seven

If you have followed this series from the start, you already know how each bit in a byte is mapped to the screen. For those who are just joining us, here is a quick recap. Each byte in screen memory controls seven pixels. The highest bit controls color. The other seven bits are free to produce patterns of lit and unlit dots.

The bits appear on the screen in what seems to be a backwards fashion. The lowest bit produces the leftmost pixel of the group. To put a specific shape on the screen, you must create the bit pattern and place those bytes in screen memory.

As we saw when dealing with character graphics, such shapes can be moved across the screen by moving the bytes to successive horizontal positions. But moving a byte causes a shape to move seven bits. Smooth animation requires smaller moves. As a first example, let's examine the case of the simplest possible shape—a single dot.

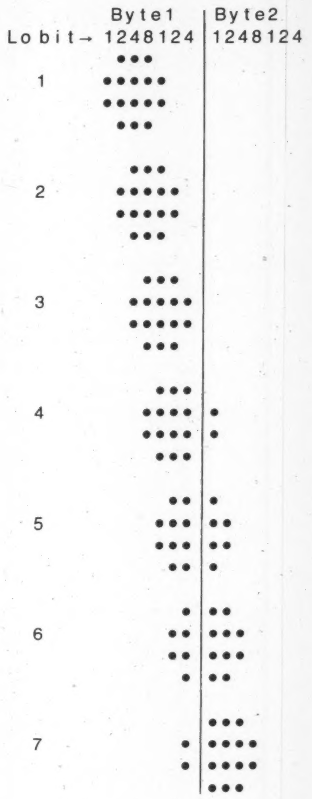
The bit pattern for such a shape might be 00000001. This, if placed in screen memory, would produce a single lit pixel in the leftmost position of the byte (as mentioned, the bits plot in a "backwards" fashion). Assume the byte was placed in location $2000. The first pixel of the hi-res screen would be lit. If the byte were moved to $2001, the pixel would jump seven places. To produce a smaller move, the byte value must be changed.

The seven positions, in hex, are 01, 02, 04, 08, 10, 20, and 40. If you put these values into location $2000, you will see a single dot move toward the right, one step at a time. Note that it alternates colors. If you skip every second value, the bit will move two locations at a time and maintain its color.

Now, if you wanted to animate such a shape in a program, you could perform the shifts on the fly, figuring out the required value based on the desired location of the pixel. For the case of a single dot, this is a simple, brief calculation. But, for any more-complex shape, the process becomes tedious and slow. Bits that are shifted out of one byte must be shifted into the next byte, and the hi bit must be skipped over.

The solution, and a technique used in virtually all modern games, it to pre-shift the shape. The programmer first creates the byte pattern for the shape. Then he calculates six more sets of values, one for each of the possible starting positions for the shape.

Basically, there are two ways to calculate the shifts. One is to use graph paper and actually draw the shape seven times, then figure out the byte values. The other method is to calculate the first set of byte values, then just shift the numbers for each new view. These seven shifted versions are placed in a table. A plotting routine can access the correct set of bytes and place the shape in the desired location.



DATA VALUE (in Hex)

Shift	Byte 1	Byte 2
1	0E	00
	1F	00
	1F	00
	0E	00
2	1C	00
	3E	00
	3E	00
	1C	00
3	38	00
	7C	00
	7C	00
	38	00
4	70	00
	78	01
	78	01
	70	00
5	60	01
	70	03
	70	03
	60	01
6	40	03
	60	07
	60	07
	40	03
7	00	07
	40	0F
	40	0F
	00	07

Ⓐ *Pattern is first drawn on graph paper.*

Ⓑ *Hex values are calculated for each shift (shifts can also be calculated arithmetically without redrawing shape).*

Ⓒ 02 04 0E 00 1F 00 1F 00 0E 00

Each shift is preceeded with length and height bytes (02, 04 in this case).

Ⓓ 00 0E 00 18 00 22 00 2C
00 36 00 40 00 4A

Offset index is calculated. Since index has 7 pairs of entries, first valve will always be $0E. Note that the offsets are given with hi byte first. See Figure 2 for final table.

Figure 1. Compiling a shape definition.

Figure 1 shows one method for creating such a table. Note that the shape, when shifted, requires an extra byte to the right for expansion. A shape generally requires an extra byte for each line, except in cases in which only the first bit of the rightmost byte is plotted. In such cases, that bit will not be shifted far enough to require another byte.

Once the table of the seven shifts is produced, we need a way to access the desired shift. One method is to use an index. The table is preceded by a series of index bytes giving the location of each shifted image. To allow flexibility, the index doesn't give an absolute location, but instead gives the offset from the beginning of the table. In contrast to the standard format, this offset is given with

Listing 1.

```
*EXCLUSIVE OR ROUTINE
* LOOKUP TABLE STARTS AT $6100
* SHAPE INDEX STARTS AT $6290
*
*
         ORG    $6000
*
XBYTE    EQU    0
XBIT     EQU    1
YLOC     EQU    2
SHNUM    EQU    $3
TEMP     EQU    $4
XCOUNT   EQU    5       ;KEEP TRACK OF X BYTE
DLO      EQU    $06     ;POINTER TO SCRN
DHI      EQU    $07
SRCLO    EQU    $08     ;POINTER TO SHAPE
SRCHI    EQU    $09
YVAL     EQU    $0A     ;SCREEN Y VALUE
COLL     EQU    $0B      ;COLLISION FLAG
PARAM    EQU    $20F9   ;SCRATCH AREA FOR SHAPE INFO
TABHI    EQU    $6100   ;LOOKUP TABLE
TABLO    EQU    $61C0
SHTB     EQU    $6290   ; INDEX TO SHAPES
SBUF     EQU    $7000   ;DUMMY LABEL. WILL BE MODIFIED BY CODE
*
```

the hi byte first. If you look at the plotting code, you will see that this method saves a bit of time when calculating the address. Thanks go to Mark Pelczarski for informing me of this neat trick.

Since shapes can be various sizes, and we want the plotting routine to handle whatever we feed it, each shifted definition is preceded by information on the height and width of the shape. First comes a value telling how many bytes across the shape is, followed by the number of lines the shape occupies vertically. A sample table is shown in Figure 2.

```
*6300.6353

6300- 00 0E 00 18 00 22 00 2C
6308- 00 36 00 40 00 4A 02 04
6310- 0E 00 1F 00 1F 00 0E 00
6318- 02 04 1C 00 3E 00 3E 00
6320- 1C 00 02 04 38 00 7C 00
6328- 7C 00 38 00 02 04 70 00
6330- 78 01 78 01 70 00 02 04
6338- 60 01 70 03 70 03 60 01
6340- 02 04 40 03 60 07 60 07
6348- 40 03 02 04 00 07 40 0F
6350- 40 0F 00 07
*
```

Figure 2. Sample shape definition. First 14 bytes are an offset index in hi byte, lo byte format. Each shift begins with width and height of the shape. This shape, placed at $6300, can be used with Listing 2.

Look up table, Listing 1.

```
*
>CALL-151

*6100.627F

6100- 20 24 28 2C 30 34 38 3C
6108- 20 24 28 2C 30 34 38 3C
6110- 21 25 29 2D 31 35 39 3D
6118- 21 25 29 2D 31 35 39 3D
6120- 22 26 2A 2E 32 36 3A 3E
6128- 22 26 2A 2E 32 36 3A 3E
6130- 23 27 2B 2F 33 37 3B 3F
6138- 23 27 2B 2F 33 37 3B 3F
6140- 20 24 28 2C 30 34 38 3C
6148- 20 24 28 2C 30 34 38 3C
6150- 21 25 29 2D 31 35 39 3D
6158- 21 25 29 2D 31 35 39 3D
6160- 22 26 2A 2E 32 36 3A 3E
6168- 22 26 2A 2E 32 36 3A 3E
6170- 23 27 2B 2F 33 37 3B 3F
6178- 23 27 2B 2F 33 37 3B 3F
6180- 20 24 28 2C 30 34 38 3C
6188- 20 24 28 2C 30 34 38 3C
6190- 21 25 29 2D 31 35 39 3D
6198- 21 25 29 2D 31 35 39 3D
61A0- 22 26 2A 2E 32 36 3A 3E
61A8- 22 26 2A 2E 32 36 3A 3E
61B0-- 23 27 2B 2F 33 37 3B 3F
61B8- 23 27 2B 2F 33 37 3B 3F
61C0- 00 00 00 00 00 00 00 00
61C8- 80 80 80 80 80 80 80 80
61D0- 00 00 00 00 00 00 00 00
61D8- 80 80 80 80 80 80 80 80
61E0- 00 00 00 00 00 00 00 00
61E8- 80 80 80 80 80 80 80 80
61F0- 00 00 00 00 00 00 00 00
61F8- 80 80 80 80 80 80 80 80
6200- 28 28 28 28 28 28 28 28
6208- A8 A8 A8 A8 A8 A8 A8 A8
6210- 28 28 28 28 28 28 28 28
6218- A8 A8 A8 A8 A8 A8 A8 A8
6220- 28 28 28 28 28 28 28 28
6228- A8 A8 A8 A8 A8 A8 A8 A8
6230- 28 28 28 28 28 28 28 28
6238- A8 A8 A8 A8 A8 A8 A8 A8
6240- 50 50 50 50 50 50 50 50
6248- D0 D0 D0 D0 D0 D0 D0 D0
6250- 50 50 50 50 50 50 50 50
6258- D0 D0 D0 D0 D0 D0 D0 D0
6260- 50 50 50 50 50 50 50 50
6268- D0 D0 D0 D0 D0 D0 D0 D0
6270- 50 50 50 50 50 50 50 50
6278- D0 D0 D0 D0 D0 D0 D0 D0
*
```

Listing 1, continued.

```
6000: A9 00     START    LDA  #$00
6002: 85 0B              STA  COLL     ;CLEAR COLLISION FLAG
6004: A5 03              LDA  SHNUM    ;GET SHAPE NUMBER
6006: 0A                 ASL          ;TIMES 2 FOR PROPER SHAPE
6007: A8                 TAY
6008: B9 90 62           LDA  SHTB,Y   ;GET ADDRESS
600B: 85 08              STA  SRCLO    ;OF SHIFTED SHAPE
600D: C8                 INY
600E: B9 90 62           LDA  SHTB,Y   ;POINT TO SHAPE
6011: 85 09              STA  SRCHI
                *
                * SRCLO AND SRCHI NOW POINT TO
                * THE BEGINNING OF THE SHAPE
                * DEFINITION. THE NEXT STEP IS TO
                * FIND THE REQUIRED SHIFT OF THE
                * SHAPE.
                *
6013: A5 01              LDA  XBIT     ;GET BIT POSITION
6015: 0A                 ASL          ;TIMES 2
6016: A8                 TAY
6017: B1 08              LDA  (SRCLO),Y ;GET HI BYTE OF OFFSET
6019: AA                 TAX          ;SAVE FOR LATER
601A: C8                 INY          ;POINT TO LO BYTE OF OFFSET
601B: B1 08              LDA  (SRCLO),Y
601D: 18                 CLC
601E: 65 08              ADC  SRCLO    ;ADJUST ORIGINAL LO BYTE
6020: 85 08              STA  SRCLO
6022: 8D 5D 60           STA  COLL1+1  ;MODIFY CODE
6025: 8A                 TXA          ;RESTORE HI BYTE OFFSET
6026: 65 09              ADC  SRCHI    ;ADJUST HI BYTE
6028: 85 09              STA  SRCHI
602A: 8D 5E 60           STA  COLL1+2  ;MODIFY CODE
602D: A0 01              LDY  #$01     ;MOVE WIDTH AND
602F: B1 08     LOOPO    LDA  (SRCLO),Y ;HEIGHT INTO
6031: 99 F9 20           STA  PARAM,Y  ;TEMPORARY AREA
6034: 88                 DEY
6035: 10 F8              BPL  LOOPO
6037: A2 02              LDX  #$02     ;FOR FIRST SHAPE BYTE
6039: A5 02              LDA  YLOC
603B: 85 0A              STA  YVAL
                *
                * SET UP IS COMPLETE. THE FOLLOWING
                * CODE DISPLAYS THE SHAPE
                *
603D: AD F9 20  LOOP1    LDA  PARAM    ;# OF HOR. BYTES
6040: 85 05              STA  XCOUNT
6042: A4 0A              LDY  YVAL     ;GET DEST LOC AND
6044: C0 C0              CPY  #$C0     ;CHECK IF OFF SCREEN
6046: 90 04              BCC  N1
6048: A0 80              LDY  #$80     ;DUMMY VALUE TO KEEP LINE OFF SCREEN
604A: B0 0C              BCS  LOOP2
604C: B9 C0 61  N1       LDA  TABLO,Y  ;ADD HOR. OFFSET
604F: 85 06              STA  DLO
6051: B9 00 61           LDA  TABHI,Y
6054: 85 07              STA  DHI
                *PUT SHAPE ON SCREEN
6056: A4 00              LDY  XBYTE    ;HORIZONTAL STARTING POSITION
6058: C0 28     LOOP2    CPY  #$28     ;CHECK IF OFF EDGE
605A: B0 13              BCS  CONT
605C: BD 00 70  COLL1    LDA  SBUF,X   ;GET BYTE OF SHAPE
605F: 85 04              STA  TEMP     ;SAVE IT
6061: 31 06              AND  (DLO),Y  ;CHECK FOR COLLISION
6063: 29 7F              AND  #$7F     ;STRIP HI BIT
6065: F0 02              BEQ  BLOCK1   ;NO COLLISION
6067: 85 0B              STA  COLL     ;SET FLAG
6069: A5 04     BLOCK1   LDA  TEMP     ;RESTORE SHAPE BYTE
606B: 51 06              EOR  (DLO),Y
606D: 91 06              STA  (DLO),Y  ;PUT IT THERE
606F: E8        CONT     INX          ;NEXT SHAPE BYTE
6070: C8                 INY          ;NEXT SCREEN LOC.
6071: C6 05              DEC  XCOUNT   ;KEEP TRACK OF HOR.
6073: D0 E3              BNE  LOOP2    ;STILL ON SAME LINE
                *1ST LINE IS ON SCREEN NOW
6075: E6 0A              INC  YVAL     ;NEXT VERT. SCRN. LOC.
6077: CE FA 20           DEC  PARAM+1  ;# OF VERT. LINES
607A: D0 C1              BNE  LOOP1    ;NOT FINISHED
607C: 60                 RTS
```

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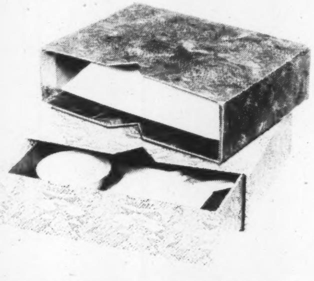

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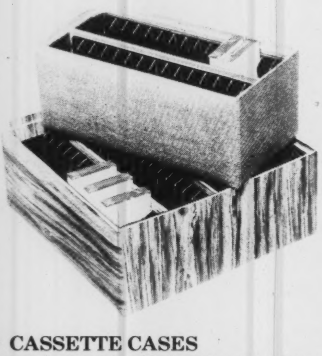
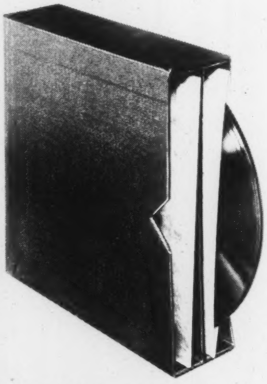
# 49	11⅜"h x 3⅛"w x 8½"d
# 103	12⅛"h x 3½"w x 9"d
# 165	14¼"h x 4⅝"w x 11"d





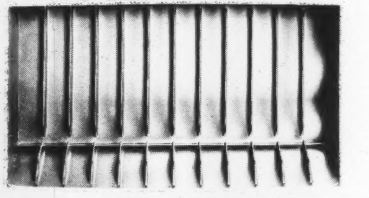


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Figure 3. Byte/bit numbering (MOD 7).

X coordinate	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12	13	14
byte	0							1							2						
bit	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6

So, now we have a table containing the correct values required to place a shape on any bit within a byte. The next step is to produce a routine that will display this table. Here, we begin to encounter the diversity of graphics styles.

There are many ways to put an image on the screen, and many ways to handle the various indexing requirements. The routine presented here lies somewhere between simple but slow code and fast but complex dedicated routines. It is a good starting point, and can be the basis for many kinds of subroutines. Afterwards, we shall look at some of the other approaches in use. For now, let's get down to plotting.

Hatching Plots

Since the plotting code is a subroutine, it will require certain parameters. Obviously, we must tell it the desired x and y coordinates of the shape. And, in case we are dealing with more than one shape, we should also provide a shape number.

Because the table contains versions of the shape for each bit position within a byte, it is convenient to break up the x coordinate into its bit and byte values. For example, horizontal location 0 is considered byte 0, bit 0. Location 2 is byte 0, bit 3; location 7 is byte 1, bit 1; and so on. You might recognize this as MOD 7 arithmetic. Later, we'll look at methods for calculating this value.

For now, take a look at Figure 3, which shows the byte/bit system. The y coordinate is just the desired vertical location. So much for the parameters. Let's take a look at the routine.

The code, shown in Listing 1, first uses the shape number to find the location of the desired shape definition. This is contained in a table. The table can be placed in any free area of memory. I chose to put it after the screen lookup table. When using this program, you will have to place the proper index values for your shapes in this table.

Next, the program uses the value XBIT to determine the location of the desired shifted version of the shape. This is where we get to the one tricky part of the code.

The 6502 is gifted with a less-than-huge selection of index registers. We will be using indirect Y to place the bytes on the screen. This leaves the X register for accessing each byte of the shape. Since indirect X indexing is slow and awkward, the ideal approach is to use absolute X indexing. In order to do this, we must resort to self modifying code.

Listing 2.

```
                 * SAMPLE ANIMATION PROGRAM
                 * USES DRAW ROUTINE AT $6000 AND
                 * A SHAPE AT $6300
                 *
                          ORG  $1000
                 *
                 * PARAMTERES USED BY DRAW ROUTINE
                 *
                 XBYTE    EQU  $00
                 XBIT     EQU  $01
                 YLOC     EQU  $02
                 SHNUM    EQU  $03
                 COLL     EQU  $0B
                 *
                 DESTLO   EQU  $F8
                 DESTHI   EQU  $F9
                 XCOORD   EQU  $FA
                 YCOORD   EQU  $FB
                 NEWBYTE  EQU  $FC
                 NEWBIT   EQU  $FD
                 OLDKEY   EQU  $FE
                 TEMP     EQU  $FF
                 DRAW     EQU  $6000
                 INDEX    EQU  $6290  ;INDEX TO SHAPES
                 *
                 *
                 * CLEAR SCREEN
                 *
1000: A9 20      START    LDA  #$20
1002: 85 F9               STA  DESTHI
1004: AA                  TAX
1005: A9 00               LDA  #$00
1007: 85 F8               STA  DESTLO
1009: A8                  TAY
100A: 91 F8      CLEAR    STA  (DESTLO),Y
100C: C8                  INY
100D: D0 FB               BNE  CLEAR
100F: E6 F9               INC  DESTHI
1011: CA                  DEX
1012: D0 F6               BNE  CLEAR
                 *
                 * ENABLE GRAPHICS
                 *
1014: 8D 50 C0            STA  $C050
1017: 8D 52 C0            STA  $C052
101A: 8D 54 C0            STA  $C054
101D: 8D 57 C0            STA  $C057
                 *
                 * INITIALIZE VARIABLES
                 *
1020: A9 13               LDA  #$13
1022: 85 FA               STA  XCOORD
1024: A9 60               LDA  #$60
1026: 85 FB               STA  YCOORD
1028: A9 00               LDA  #$00
102A: 8D 90 62            STA  INDEX
102D: A9 63               LDA  #$63
102F: 8D 91 62            STA  INDEX+1
                 *
                 * PUT A SQUARE ON THE SCREEN
                 *
1032: A9 FF               LDA  #$FF
1034: 8D 10 23            STA  $2310
1037: 8D 10 27            STA  $2710
103A: 8D 10 2B            STA  $2B10
103D: 8D 10 2F            STA  $2F10
                 *
                 * PUT SHAPE ON SCREEN BEFORE
                 * START OF ERASE/REDRAW CYCLE
                 *
1040: A9 00               LDA  #$00
1042: 85 03               STA  SHNUM
1044: A5 FA               LDA  XCOORD
1046: 20 C5 10            JSR  MODSUB
1049: 85 01               STA  XBIT
104B: 86 00               STX  XBYTE
104D: A5 FB               LDA  YCOORD
104F: 85 02               STA  YLOC
1051: 20 00 60            JSR  DRAW
```

The routine accesses the shape bytes with the command LDA ADDRESS, X. Before reaching this code, the value of the address is modified to point to the desired shape bytes. Once this has been done. We can start plotting.

Each shape is preceded by its width and height in bytes. This information is moved into a scratch area (the sample program uses part of the unused hi-res area for scratch storage, but this can be changed to zero page locations to increase speed of operation).

The program contains two loops; the inner loop grabs each byte of a line, and the outer one loops through each line of the shape. The code also checks for screen boundaries, clipping any shape that goes beyond the screen. This half page of code is all that is required to place a shape on the screen. The code also contains a collision check. This, and the check for screen boundaries, are excess baggage. If your application doesn't require them, they can be eliminated.

As mentioned, the code requires you to pass on bit and byte values for the x coordinate. There are several ways to obtain this value. One way is to perform a MOD 7 loop. Take the x coordinate and divide it by seven. The result is the X byte; the remainder is the bit.

A faster approach is to use a set of lookup tables, one containing the byte values, the other containing the bit values. The byte table would begin with seven 0's, then seven 1's, seven 2's and so on. The bit table would cycle from 0 through 6 repeatedly.

The easiest way to create such a table is to write a Basic program that POKEs the values into memory, and then to save the table to disk. The third method is to update the byte and bit values constantly as the shape moves. But this is slow and tedious.

One advantage to using the byte/bit method is that objects can be tracked when they leave the screen. Since the screen is only 40 bytes across, and since the byte variable can go up to 255, you can keep track of the position of an object over an area that is actually more than six screens wide.

As an example of how this plotting routine might be used, Listing 2 contains a program that demonstrates animation and collision detection. It puts a small square and a ball on the screen. You control the ball with the keys, using A, Z, left arrow, and right arrow for movement, space to halt movement, and escape to leave the program (this is the same control method used in the character animation program we saw a while back). Whenever the ball hits the square, the program restarts. Naturally, any real

Listing 2, continued.

```
                *
                * FOLLOWING CODE WILL ERASE THE
                * SHAPE AT THE OLD LOCATION AND
                * PUT IT AT THE NEW LOCATION.
                * SINCE THE DRAW ROUTINE MAINTAINS
                * ITS PARAMETERS, NO CALCULATION
                * IS NEEDED FOR ERASURE.
                *
1054: A5 FA     MAINLOOP LDA  XCOORD ;PREPARE PARAMETERS
1056: 20 C5 10           JSR  MODSUB ;FOR NEW LOCATION
1059: 85 FD              STA  NEWBIT ;TO MINIMIZE DELAY
105B: 86 FC              STX  NEWBYTE ;BETWEEN ERASE AND DRAW
105D: 20 00 60           JSR  DRAW   ;ERASE OLD SHAPE
1060: A5 FD              LDA  NEWBIT
1062: 85 01              STA  XBIT
1064: A5 FC              LDA  NEWBYTE
1066: 85 00              STA  XBYTE
1068: A5 FB              LDA  YCOORD
106A: 85 02              STA  YLOC
106C: 20 00 60           JSR  DRAW   ;PUT UP NEW SHAPE
106F: A5 0B              LDA  COLL   ;CHECK FOR COLLISION
1071: F0 03              BEQ  READKEY ;NO COLLISION
1073: 4C 00 10           JMP  START  ;COLLISION
                *
                *
                * SHAPE HAS BEEN DRAWN.
                * TIME TO CHECK KEYBOARD AND
                * ADJUST LOCATION.
                *
1076: AD 00 C0  READKEY  LDA  $C000  ;CHECK KEYBOARD
1079: 30 02              BMI  FOUNDKEY ;IF MINUS, KEY HAS BEEN PRESSED
107B: A5 FE              LDA  OLDKEY ;USE LAST VALID VALUE
107D: C9 C1     FOUNDKEY CMP  #$C1   ;A
107F: F0 17              BEQ  UP
1081: C9 DA              CMP  #$DA   ;Z
1083: F0 1A              BEQ  DOWN
1085: C9 88              CMP  #$88   ;LEFT ARROW
1087: F0 1D              BEQ  LEFT
1089: C9 95              CMP  #$95   ;RIGHT ARROW
108B: F0 20              BEQ  RIGHT
108D: C9 A0              CMP  #$A0   ;SPACE
108F: F0 2A              BEQ  PAUSE
1091: C9 9B              CMP  #$9B   ;ESCAPE
1093: F0 1F              BEQ  GETOUT
                *
                * NO VALID KEY HAS BEEN FOUND
                *
1095: 4C BD 10           JMP  KEYDONE
                *
                * ROUTINES TO HANDLE THE
                * VARIOUS KEYBOARD ENTRIES
                *
1098: 85 FE     UP       STA  OLDKEY
109A: C6 FB              DEC  YCOORD ;TOP IS 0 SO USE DEC TO MOVE UP
109C: 4C BD 10           JMP  KEYDONE
109F: 85 FE     DOWN     STA  OLDKEY
10A1: E6 FB              INC  YCOORD
10A3: 4C BD 10           JMP  KEYDONE
10A6: 85 FE     LEFT     STA  OLDKEY
10A8: C6 FA              DEC  XCOORD
10AA: 4C BD 10           JMP  KEYDONE
10AD: 85 FE     RIGHT    STA  OLDKEY
10AF: E6 FA              INC  XCOORD
10B1: 4C BD 10           JMP  KEYDONE
10B4: 2C 10 C0  GETOUT   BIT  $C010
10B7: 8D 51 C0           STA  $C051  ;RESTORE TEXT
10BA: 60                 RTS
10BB: 85 FE     PAUSE    STA  OLDKEY
                * DELAY FOR A WHILE, THEN JUMP BACK
                *
10BD: A9 40     KEYDONE  LDA  #$40   ;TRY DIFFERENT VALUES HERE
10BF: 20 A8 FC           JSR  $FCA8  ;MONITOR DELAY ROUTINE
10C2: 4C 54 10           JMP  MAINLOOP
                *
                * THE MOD 7 SUBROUTINE CALCULATES
                * THE BIT AND BYTE LOCATION BASED
                * ON THE X COORDINATE.
                * ENTER WITH X COORDINATE IN A.
                * ON EXIT A=BIT, X=BYTE
                *
10C5: A2 00     MODSUB   LDX  #$00   ;X IS BYTE COUNTER
10C7: C9 07     MODLOOP  CMP  #$07
10C9: 90 06              BCC  MODDONE ;LESS THAN 7
10CB: 38                 SEC
10CC: E9 07              SBC  #$07   ;DECREASE VALUE
10CE: E8                 INX       ;INCREASE BYTE COUNT
10CF: D0 F6              BNE  MODLOOP ;ALWAYS TAKEN
10D1: 60        MODDONE  RTS
```

game would do something more spectacular at this point.

Note that the MOD subroutine only handles values up to 255. To go higher, the routine would have to be modified to handle a two-byte value. The plotting routine uses exclusive or to draw and erase the shape. This is just one of many possible approaches, which brings us to our next topic and our question of the month.

Charles Kluepfel wrote to ask whether exclusive or is still the best method for plotting, or whether other techniques have made it obsolete.

Getting It On

A byte can be placed on the screen in various ways. Each method has advantages and drawbacks. The advantage to exclusive or is that it leaves the background undisturbed. The first EOR puts the shape up, a second EOR with the same shape and coordinates erases the shape, restoring the background. Any number of shapes can overlap, and they can be removed in any order, leaving the background the way it was after the last shape leaves.

The disadvantage is that when shapes overlap, black areas are produced. If two identical shapes are plotted in the same location, both will vanish until one is moved. Still, EOR is fast and efficient, and has been used with fine results in many games. *Bandits* and *Tsunami* are two good examples of games that use exclusive or for plotting.

A faster method is to use a straight block draw. Here, instead of the sequence of an exclusive or followed by a store, the shape definition is just stored to the screen. The shape actually wipes out anything underneath it.

While this wiping out might seem to be a liability, it has one powerful aspect. Since it wipes out whatever was there before, it can be used to erase itself.

If the shape is defined with a blank border around it, and the border is as high and wide as the largest move the shape will make, the image never has to be erased. Every time it is plotted, it will wipe out the old image. This produces fast plots.

The biggest disadvantage is that as shapes overlap, the top shape will wipe out a portion of any shape plotted previously. Good examples of this technique can be seen in *Space Eggs* and *Gorgon.*

For really clean animation, the shape can be put on the screen with ORA. This produces some of the cleanest graphics around, at the cost of some loss of speed. Take a look at the portion of *Beer Run* where the blimp passes behind the ledges. I asked Mark Turmell how he achieved this clean animation. He explained that he combines orring with page flipping. The shapes are placed on the unseen screen with ORA, and erased with AND or just by storing 0's to the area occupied by the shape. It is this erasure that creates a potential problem.

When a shape is erased using AND (generally, the shape byte is first EORed with $FF, producing a "negative" of the mask, and then ANDed with the screen), any background beneath the shape is also erased.

There are two possible solutions. One is to store the original background somewhere. The other is to redraw anything that might be erased. In *Beer Run*, the ladders are redrawn every time.

These, and other methods, are all in current use. The selection depends on the specific requirments of the program. Once you are familiar with these techniques, you will be able to tell how most games are done by just looking carefully at the graphics. Each technique has its distinct signature.

There is no need for each shift of a shape to be identical. It is possible to

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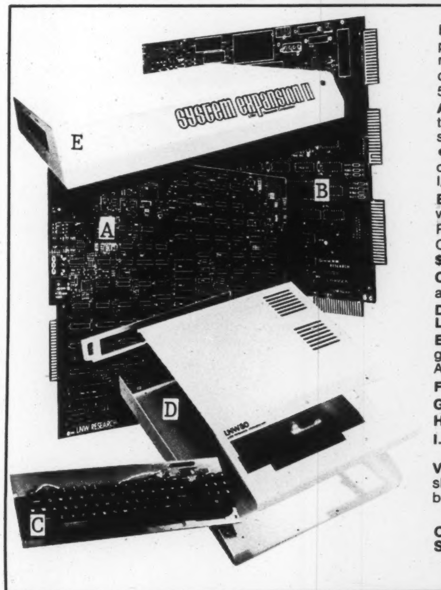

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Graph Paper, continued...

produce internal animation by changing positions in each of the seven shifts. This way, as an object moves horizontally, it also becomes animated. I am not positive, but I believe this is the technique used in *Apple Panic* to animate the running man and the enemy apples.

If the shape is to be moved one pixel at a time, the animation is created in sequence from the first to last shift. If the shape is moved two bits at a time to preserve color, the sequence is 1,3,5,7,2,4,6 since this is the order in which the shifted versions will occur.

For internal animation when a shape is moving vertically, or remaining in one place, you merely use a sequence of different shapes. In some cases, two views are sufficient; at other times, more are needed.

Not only are there many ways to put an image on the screen, there are also various approaches to a plotting program. As mentioned, the one above lies in the middle as far as speed and complexity are concerned. Some programs contain highly dedicated plotting routines, similar to the dedicated scrolling mentioned last month. Since such routines can vary enormously depending on the nature of the program, I'll just discuss the basic concept here.

Let's say you want to plot many instances of a single shape. Since the width and height of the shape will be constant, there is no reason to pass this informatin to the plotting routine. A special routine can be coded which is designed for a shape of that particular size.

Going further, it is conceivable that you would have seven plotting routines—one for each shifted location—each of which contained the desired byte values, thus avoiding any need to index into a table for the shape bytes. The use of indirect Y, one of the bottlenecks of graphics, can be bypassed using routines that already contain the required addresses. And, as already mentioned, any frills, such as collision detection or boundary checks, can be stripped when not needed.

In general, whenever speed is essential, the plotting routine should be as specific and dedicated as possible. This eats up memory, but 48K is a lot of space. Come to think of it 48K is an incredible amount of space. I believe the first version of *Microchess* was written to run on a 1K Kim.

Many early Apple games, including some very nice graphics by Bob Bishop, were written in under 16K. I am currently involved in writing games for the Atari VCS which has a grand total of 4K of ROM and 128 bytes of RAM.

While I'm on the topic, and since even the most virtuous of columnists has been known to fall from grace with an occasional boast or plug, I may as well mention my new game, *Fantastic Voyage* (based on the movie and distributed by Fox Games). It has a few neat graphic touches, such as a clock and oscilloscope, and all in all I'm pleased with the way it came out. O.K., I'm done with the self-serving portion. I'll try not to let it happen again.

While pre-shifting is one of the keys to fast graphics, it is still possible to bog down a program. If you try to move too many shapes, or if the shapes are too large, the program will begin to crawl. The best thing to do in such situations is to save time wherever possible.

If a shape can be whittled down slightly, you will save time whenever it is plotted. If a shape is nine bits wide, its shifted version will require three bytes across. Cut it down to eight bits and it will fit in two bytes. If the same shape is eight lines high, the first version will contain 24 bytes while the second is pared down to only 16 bytes.

If you are not using a block draw, the empty bytes need not be included at the edge of each line of a shape definition. They need only be included in the later shifts when there are actually data in the byte.

The more often a section of code is repeated, the more important each wasted cycle becomes. An extra operation which occurs only once won't cause any problem. But wasted time in loops can really slow down a program. This is where a bit of thought and elegance can come in handy. A few examples follow.

Trimming Code

One common way to save a value is to push it onto the stack. For instance, let's say you want to AND a byte with some constant, store the result, then AND the original byte with some other constant. If the byte is saved and recalled with PHA, PLA, the combined operations require seven machine cycles (PHA takes three and PLA takes four). If, instead, you store and load the value using a zero page location, the process requires only six cycles.

If you have a register free, you can use TAY, TYA and take only four cycles. Again, while a saving of one cycle doesn't matter in isolated code, it could become crucial in a loop. To save and restore a value in the X register, you can use TXS and TSX, each of which requires only two cycles. However, if the proper value isn't restored to the stack pointer, the results could be somewhat disastrous, so use this one carefully.

Suppose the accumulator and both registers contain needed values, but you want to determine whether some location in memory has the hi bit set. Rather than save off one of the registers in order to load and test the byte, you can use the BIT operation. Among other things, this tells you whether a hi bit is set without disturbing the accumulator.

While operations such as TXS and BIT are not as commonly used as some of the other 6502 commands, it pays to become familiar with them. There are usually many ways to produce a desired result, and there is almost always a better way than the one that first comes to mind. Take a look at the code in Listing 1. See if you can streamline some of the operations, or find an elegant way to reduce the required steps. Any time you can replace a slow command, such as INC (five cycles) with a faster command such as INY (two cycles), you'll streamline your code.

Beyond looking for quicker ways to perform a series of operations, look for alternative approaches. The first plotting routine I wrote didn't use self-modifying code. It moved the shape definition into a standard buffer area and indexed it from there. Needless to say, this block move was time-consuming.

If had I concentrated my attention on streamlining the block move, rather than looking for alternative approaches, I would have ended up with a faster version of a slow routine. Again, look at Listing 1 and see if you can find a better approach to any portion of the routine.

Well, that pretty much covers the area of pre-shifted shapes. But remember, though it is a good technique and widely used, keep an eye out for alternatives. You could just come up with something that will blow everything else away. It has happened before.

Next month we will look at moving and controlling multiple shapes, dive into sound effects, and cover the general structure of games. ☐

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COMPUTERS

MODULAR PERSONAL COMPUTER

Spectra Video, Inc, has announced the Spectravideo SV-318 modular designed personal computer system priced at $299.95.

Features include a Z80A CPU built-in 32K ROM memory capacity that is expandable to 64K, built-in 32K RAM memory capacity that is expandable to 128K, a 3.6 MHz clock, and built-in extended Microsoft Basic interpreter and internal monitor program.

The keyboard features 71 keys including upper and lower case alphabet, 52 graphics symbols, 10 user-definable functions, and 16 colors directly addressable from the keyboard.

The computer features a built-in joystick, game cartridge slot, high-resolution graphics (256 x 192), CP/M 2.2 and 3.0 compatibility, and program status line on screen.

Screen layout provides 32 characters per line in the graphics mode and 40 characters per line in the text mode (24 lines in both modes). Editing specifications include cursor control (up/down/left/right/home/clear), insertion and delete keys. The sound capability of the SV-318 is three channels with eight octaves per channel.

The 15 Spectra Video accessories that are available for immediate delivery include the Dual Channel/Stereo Data Cassette Drive, Floppy Disk Drive, Dot Matrix Printer, Seven Slot Super Expander, Dual Baud Rate Modem; Sensor Touch Graphic Tablet, Single Slot Expander, Colecovision Game Adaptor, Disk Drive Controller Cartridge, Centronics-Printer Interface, RS-232 Interface Cartridge, 80-Column Display Card, 16K RAM Expander Cartridge, 32K RAM Expander Cartridge, and Quik-shot Joystick Controller.

Spectra Video, 39 West 37th St., New York, NY 10018.

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PORTABLE COMPUTER

Non-Linear Systems, Inc., has announced the Kaycomp II, a portable, self-contained, general purpose computer which includes a large display, two double density disk drives, and a Keytronics keyboard with numeric keypad.

The unit features a Z80A central processor, and comes with the CP/M operating system, MBasic, *Multiplan* spreadsheet, and *Select* word processor.

Interface accommodations include Centronics parallel output, video output, and RS-232C serial interface. $1795.

Non-Linear Systems, Inc., 533 Stevens Ave., Solana Beach, CA 92075. (714) 755-1134.

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APPLE III SOFTCARD

Apple has announced the Apple Softcard III System.

Designed by Microsoft Corporation, the Apple Softcard III System is a complete hardware and software environment that increases access to business, scientific, and education programs written using the CP/M operating system and the Z80 microprocessor. Through the Apple III Sophisticated Operating System (SOS), existing CP/M applications can take advantage of the ProFile mass disk storage system and the easy configurability of the Apple III.

The Softcard III package includes a plug-in Z80 microprocessor card, an Apple Softcard III Master diskette, an SOS-CP/M utilities diskette, and four manuals discussing card installation and use of CP/M software. The system also provides for the use of Microsoft Basic.

Microsoft Corporation, 10700 Northrup Way, Bellevue, WA 98004.

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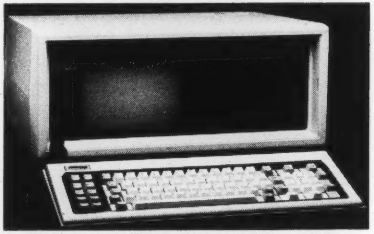
IBM PC-COMPATIBLE PORTABLE COMPUTER

Compaq Computer Corporation has introduced the Compaq Portable Computer, a self contained, 16-bit system that is compatible with the IBM Personal Computer.

Housed in a compact carrying case, the basic system includes a high-resolution, 9" diagonal video display; a 16-bit Intel 8088 microprocessor with 128K bytes of RAM, expandable to 256K bytes on the main system board; a 5 1/4" floppy disk drive with 320K bytes of storage capacity, and room for an optional second 320K drive. It has an MS DOS operating system and advanced Basic licensed from Microsoft Corp.



The basic system, which sells for $2995, also includes ports for an optional RGB color video monitor, composite video, and connection to a standard television set through an RF modulator. It also has a parallel printer interface and a socket for an Intel 8087 co-processor. An asynchronous communications interface is optional.

Also included are three IBM PC-compatible hardware expansion slots which make it possible to add extra memory, peripheral attachments and other options available from both the company and independent vendors.

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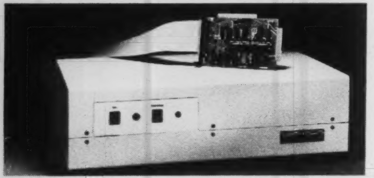


A low cost, 5Mb hard disk system for the IBM PC is now available from Computer Dynamics, Inc.

The Win 5-IBM is a complete subsystem, operating under MS-DOS. The unit features a Shugart Winchester with a 4.8 Mb data transfer rate.

As it is external to the PC, problems with heat build-up are avoided. $1695.

Computer Dynamics, Inc., 105 S. Main St., Greer, SC 29651. (803) 877-7471.

CIRCLE 405 ON READER SERVICE CARD

8 INCH DUAL DENSITY CONTROLLER

Sorrento Valley Associates has introduced the Pro-Guard 8" dual density controller, designed specifically for the Apple III. When configured with two Shugart compatible drives, the Pro-Guard provides up to 2 Mb of on-line storage or hard disk backup for all standard SOS and DOS application programs.

SVA's adherence to IBM 3740 and System 34 media formats also allows data transportability via the 8" floppy, between the Apple III and other computers, including IBM mainframes.

Pro-Guard is compatible with SVA's AMS 8000 8" drives, 5 1/4" drives, Thinline 8" drives and double data minis.

SVA Inc., 11722 Sorrento Valley Rd., San Diego, CA 92121.

CIRCLE 406 ON READER SERVICE CARD

TERMINALS & I/O

MICRO LINK MODEM

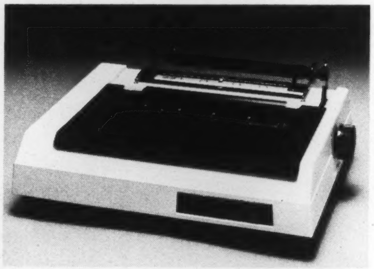
The Micro Link 1200 modem is Bell 212 compatible and operates at 1200 baud (120 characters per second) in full duplex over standard phone lines, using a standard RS-232C interface.

The unit provides manual originate/manual answer operation. An analog loopback self-test feature is included. There are also five front-panel LED indicators. $449.

U.S. Robotics, Inc., 203 N. Wabash, Suite 1718, Chicago, IL 60601. (312) 346-5650.

CIRCLE 407 ON READER SERVICE CARD

DOT MATRIX PRINTER



The Microprism dot matrix printer from Integral Data Systems, Inc., offers print quality approaching that of a daisywheel printer.

Available in serial and parallel versions, the unit features automatic line buffering with 1400 bytes standard, and speeds of 75 cps in the correspondence-quality and 110 cps in high-speed data mode. $799.

Integral Data Systems, Inc., Milford, NH 03055. (603) 673-9100.

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NEC Thimbles - All Styles	$18

NEC DOT MATRIX	
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FOUR COLOR MICRO-PLOTTER

Radio Shack has added a four color printer with graphics plotting capability to their peripheral line. The TRS-80 Color Graphic Printer can create anything from doodles to four-color pie charts, as well as more standard text and graphics. ASCII characters (96) are available, along with image plotting.

The text mode offers 40- and 80-character lines at 12 cps. Parallel and serial interfaces are built in.

The unit is compatible with all Radio Shack computers and terminals. $250.

Tandy Corporation/Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102. (817) 390-3272.

CIRCLE 409 ON READER SERVICE CARD

NTSC/RGB MONITOR

Panasonic Video Systems Division has announced the CT-1350MG monitor, featuring pushbutton NTSC/RGB selection.

The monitor has a horizontal resolution of more than 400 lines from RGB. The 13" CRT uses a high contrast matrix for sharpness. Audio is also standard.

Panasonic, One Panasonic Way, Secaucus, NJ 07094. (201) 348-7182.

CIRCLE 410 ON READER SERVICE CARD

CPU's, MEMORY

DUAL PROCESSOR UPGRADE FOR HEATH/ZENITH-89

TMSI announces H-1000, the Ann Arbor board, a board that turns a Heath H89 or Zenith Z89 into an 8086-based system. The board contains an 8086, a 4-megahertz Z80, and 128K of RAM. The H-1000 replaces the standard CPU board.

The board will be shipped along with the customer's choice of CP/M-86 or MS-DOS. The Customer's CP/M-80 or HDOS will run with the new board with no changes.

The board can hold up to a megabyte of RAM and can be programmed to emulate a disk drive. Multi-user support is also promised. $1495.00.

Technical Micro Systems, Inc., 366 Cloverdale, Ann Arbor, MI 48105.

CIRCLE 411 ON READER SERVICE CARD

PERIPHERALS

LOW COST LASER VIDEODISC PLAYER

The PR8210 is an industrial duty laser videodisc player which can be operated in stand-alone mode or as a computer peripheral. The PR8210 has a serial computer control port as well as a wireless infrared remote control keypad.

Like the consumer players, the PR8210 has pause; three times normal forward and reverse speeds; forward and reverse scan to chapter stops; forward and reverse slow motion; freeze; chapter and frame search and stop; and switchable two-channel audio.

Heavy duty motors and optical drive system allow the player to be used in continuous duty applications such as training and point-of-sale displays.

Price is $740 to $845 depending upon quantity.

Pioneer Video, 200 West Grand Ave., Montvale, NJ 07645. (201) 573-1122.

CIRCLE 412 ON READER SERVICE CARD

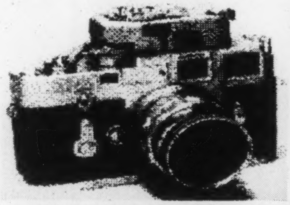
LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution** — a 256 × 256 picture element scan
- **Precision** — 64 levels of grey scale
- **Versatility** — Accepts either NTSC or industrial video input
- **Economy** — A professional tool priced for the hobbyist

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the Hi-Res screen



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Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 / FSII Camera Price: $299.00 / Combination Price: $599.00

ADDITIONAL SOFTWARE FOR THE DS-65

—**Picture Scanner:** Provides a variety of different dithering algorithms for compressing the digitized image into the Hi-Res screen. Available on 13-sector disk. Price: $39.95

—**Superscan:** Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Print routines for the Anadex and Paper Tiger* are provided. Comes on a 13-sector disk. Written for The Micro Works by Magna Soft. Price: $79.95

—**Portrait System Software:** This program includes captions and a credit line, reverse printing for T-shirt application and the option to save portraits on disk. Specifically for use with a Malibu 165 printer. Call or write for more information.

*Paper Tiger is a trademark of Integral Data Systems, Inc.

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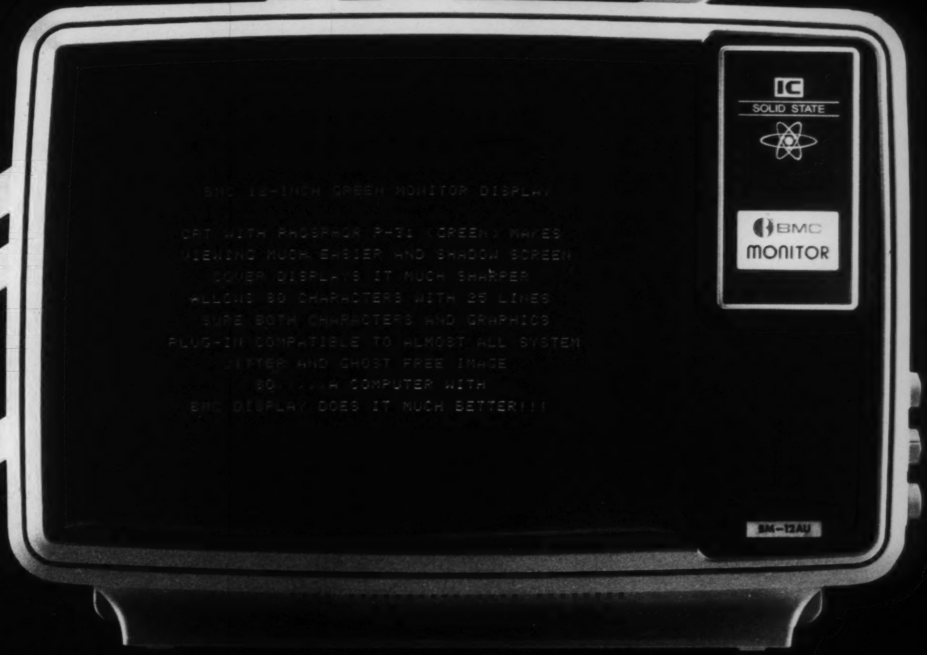

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If you choose your display monitor with the same care you've given to the other components of your business or personal computer system, you'll choose BMC.

The BM-12AU features a P31 picture tube that gives you a large, bright 12inch diagonal green display with a bold 80×24 character format that is remarkably easy on your eyes. And each unit is given a careful underscan adjustment at the factory so even the corners are clear and sharp. The BM-12AU connects quickly and simply to most popular computers with no interface or modifications needed. But best of all the BM-12AU is designed to fit your budget. Compare specifications, quality and price. BMC is the logical choice.

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- Phosphor: P31 (Green)
- Semiconductors:
  IC 1, Transistors 14, Diodes 14
- Video Amp Bandwidth: 15 MHz
- Display Format:
  1920 Characters max. (80 char. × 24 lines)
- Power Input: AC 120V, 60Hz/230V, 50Hz
- Power Consumption: 26W
- Dimensions: 40.0(W) × 28.5(H) × 32.0(D) cm
- Weight: 6.3 kgs. (13.9 lbs.)

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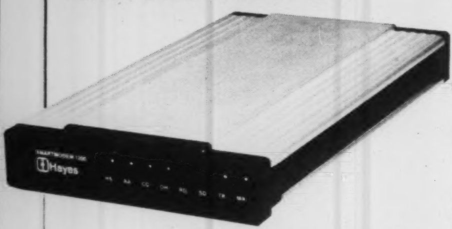
CIRCLE 121 ON READER SERVICE CARD

New Products, continued...

HAYES SMARTMODEM 1200



Hayes Microcomputer Products, Inc. has introduced the Hayes Stack Smartmodem 1200, a Bell 212A compatible modem that lets RS-232-C compatible computers or terminals communicate over telephone lines at 1200 baud. It connects directly to the telephone line and an RS-232-C port. The Smartmodem 1200 is approved by the FCC for direct connection to any U.S. telephone system for both pulse and Touch-Tone dialing.

The Smartmodem 1200 carries a two year limited warranty. Included with the Smartmodem 1200 unit are: a power pack, one modular telephone cable to connect the unit to the telephone and an owners manual. $699.

Hayes Microcomputer Products, Inc., 5835 Peachtree Corners East, Norcross, GA 30092.

CIRCLE 413 ON READER SERVICE CARD

MISCELLANEOUS

OSBORNE I BATTERY PACK

The Bits Power System is a portable battery pack for the Osborne, including integral electronics and controls. Charger and vehicle interface are also provided.

Stand-alone operating time is three to four hours. The standard computer power supply remains inactive, eliminating 37% of the heat normally produced by it. $180.

Burns Industrial Technical Service, 6456 Danbury, Dallas, TX 75214. (214) 361-4815.

CIRCLE 414 ON READER SERVICE CARD

SPEECH SYNTHESIS FOR VIC

Metavox is a speech synthesis system for the Vic-20, announced by Metaresearch Inc. The system uses a plug-in card to generate phonemes. Messages can be edited with included software, then sent to the card from Basic programs.

Metavox is configured for use on unexpanded Vic systems. Vocabulary and machine language driver software is stored at the top of memory, leaving the bottom free for Basic programs.

The package includes port card, editor software, Basic and machine language output subroutines, and user manual. $189.

Metaresearch, Inc., 1100 S.E. Woodward, Portland, OR 97202. (503) 232-1712.

CIRCLE 415 ON READER SERVICE CARD

REPRINT BOOKLET

Inc. Magazine has put together a collection of article reprints in a 21-page booklet titled "Computers: Answers To Questions You Never Thought To Ask." Some of the articles included are: How To Buy A Little Computer, An Apple On Every Desk, Jim Umbaugh Used To Hate Computers, A Buyer's Guide To Personal Business Computers, How VisiCalc Works, A Buyer's Guide To Personal Business Software, Can A Little Computer Solve All Your Problems?, Eight Problems A Computer Can't Solve, and How To Avoid The Pitfalls Of Computer Contracts. The booklet is available for $5.50 post-paid.

Inc. Magazine, Attn.: Randi Straus, 38 Commercial Wharf, Boston, MA 02110.

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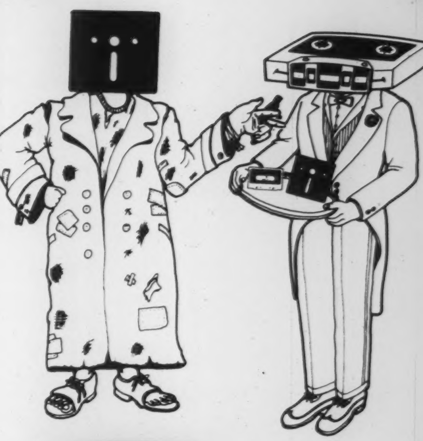

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All issues from July 1981 available — ask for list. Programs are for the **Extended BASIC** models and occasionally for disks.

Chromasette MAGAZINE P.O. Box 1087 Santa Barbara, CA 93102 (805) 963-1066

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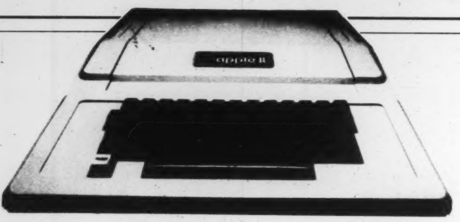

le cart...apple cart...apple

Michael Coffey

Due to the financial emphasis of this issue of the magazine, we will dig into the money compartment of the Apple Cart. In it we find a book to help you learn Visicalc, and instructions on how to balance your checkbook with Visicalc or another spread sheet language.

The Power of Visicalc Volume I

This low budget book by Robert E. Williams and Bruce J. Taylor does exactly what *The Visicalc book Apple Edition* does not. It gives complete descriptions of solved practical problems. It does not always make clear the motivation behind the problems it tackles, but it covers an awful lot of ground, including some very advanced material.

The Power of Visicalc contains the documentation for six ambitious Visicalc models. The topics are: accounts receivable aging, customer invoicing, equipment, rental stock monitoring, manufacturer production scheduling, manufacturer job cost estimating, and checkbook accounting.

The first chapter is a key-by-key demonstration of how to update a monthly ledger by saving and reloading parts of the worksheet. It uses the legendary DIF format. Another example shows how to use a lookup within a lookup, and how to calculate values for a lookup table before using the table. Williams and Taylor know countless ways to use tables, and they share a wealth of secrets. Because the book was produced almost entirely by computer printers, it lacks graphic polish. Everything is clearly legible, however, and the 88 pages contain very little fluff. It is published by Management Information Source of Portland, OR, and costs $9.95.

Registers for the Draughts

Few people today enjoy balancing their checkbooks. My favorite form of guilt is that which bugs me as I postpone the rite of reconciliation. The computer helps by letting me catch up quickly at a later date. Those who enjoy budgeting should also appreciate the record keeping abilities of their Apples.

The simplest way to record checks and reconcile with the bank is to run a specialized checkbook program. These programs usually cost about $40. They lead you through the process of checking each entry on the bank statement against the entries in your register. The register itself is stored on disk. The best programs include a good screen editor streamlined for entry of checks and deposits.

Many of the record oriented file managers can also handle checkbooks. If the program you use for telephone directories or mailing lists can sort and print calculated columns, you should think of your checking account as a type of database.

Visicalc Check Register

Visicalc is a language for describing spreadsheets and other arithmetic arrays. You can write a self calculating check register in a spreadhseet language. You can use data from the register in other programs you buy or write.

To make a check register, you must lay out fields in the worksheet, fill in some input data, install formulas, test it and use it. The goal is the worksheet picured in Figure 1. Once the worksheet starts working, you need enter only additional data as you write checks and receive statements.

Because most of our numbers should be displayed in dollars and cents format, type /GF$ in Visicalc before doing anything else. Next, place the names of the columns at the top of the sheet. Use repeated hyphens to set the column titles off from the columns. You should freeze titles to the top of the screen with a /TH command issued from the row with the hyphens.

Check numbers should be displayed as whole numbers left justified in the first column. Typing >A4:/FL will get the column started. We must extend this format further down the column in order to avoid retyping it many times. We can extend as far as necessary for the nmber of checks to be entered. The command /RA4.A4:A5.A100 will format almost 100 check number fields. This replicate command, and all others in this article, should be made fully relative by pressing R at each RELATIVE OR NO CHANGE prompt.

The input area can now accept data. Starting at A4, type a check number, press the right cursor key, type the date, and continue. The date has to be prefixed by a quote sign to prevent Visicalc from dividing the month by the year. You place the amount in column E only for checks and other debits. Column F is for the amounts of deposits and other credits. Ignore the All Clear? and Balance column until you have completed the first six columns for about 10 checks.

The first formula to install is the balance calculator. You can always add any deposit amount to and subtract any check amount from the old balance to get the new balance. The best place to put the opening balance is cell H3, where a dashed line now sits. Use the >H3 command to get to this cell within the title zone. For good looks, put a hyphen line at H2 while the cursor is in the area.

Make the first Balance formula +H3+F4-E4 at location H4. Now copy that formula all the way down the column with /RH4.H4:H5.H100. Column H should now show a correct running balance based on the check and deposit amounts you typed. Test it with all sorts of numbers until you are confident that it works.

Next, the All Clear column helps match your numbers to the bank's. Make sure that cell G4 is blank, enter /F* there and copy it down the column. This gives the column a graphic format. Cells that contain 1 will each show a single star. Cells that contain 0 will display no stars. Cells containing higher numbers would show more stars, but we don't want that.

The last column on the sheet, not seen

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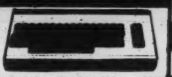

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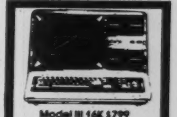

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in any report, is the Outstanding Amounts column. Start with +(1-G4) * (F4-E4) in cell I4 and fill the column with relative copies. This formula results in 0 if the corresponding All Clear entry contains 1; otherwise, it shows the net amount, positive for a deposit, negative for a check, of the transaction.

At the bottom of the Outstanding Amounts column, put the total, >I101:@SUM(I4.I100). Subtracting this number from the final figure in the Balance column gives the balance that should be on the bank statement.

You can create a reconciliation center in the lower left of the sheet. Make labels for book balance, outstanding, and bank balance. This table is created with:

```
>A102:BOOK BALANCE
>A103:OUTSTANDING
>A104:BANK SHOULD BE

>B102:+H100
>B103:+I101
>B104:+B102-B103
```

For smoothest operation, recalculation should be done row by row instead of column by column. Normally, Visicalc evaluates all of column 1 before evaluating row 1 of column 2. Since the reconciliation formulas in column B refer to values calculated in later columns, we want Visicalc to finish row 101 before calculating row 102. To force row oriented calculation, enter the command/GOR.

If you set a horizontal window at the bottom of the screen to hold only these three formulas with labels, you will have a feedback window that will be very helpful when entering data.

The Act of Reconciliation

The hard part is over. Scan the entries and compare to your bank statement, entering a 1 into the All Clear cell for each check and deposit reflected in the bank statement. Make little check marks on the bank statement, too. When the input data is complete, the bottom line should contain the same balance as the bank statement shows. ☐

```
Check      Date       To         For             Check   Deposit        All   Balance
Number                                          Amount    Amount     Clear?   -------
----------------------------------------------------------------------------     0.00
           4/16       Deposit    startup                  700.00               700.00
  101      4/30       Asnj       lesson          27.90                         672.10
  102      5/6        Cash                       59.00                         613.10
           4/30       Deposit    paycheck                 345.00               958.10
  103      5/??       Cash                       99.00                         859.10
  104      5/12       Filenes    shoes           38.00                         821.10
           5/20       Deposit    paycheck                 345.00              1166.10
           5/21       Fbank      fee-check        7.43                        1158.67
           6/15       Deposit    paycheck                 500.00              1658.67
                                                                              1658.67
                                                                              1658.67
                                                                              1658.67
                                                                              1658.67
                             Book Balance 1658.67
                              Outstanding 1658.67
                           Bank Should Be 0
```

Figure 1. This short Check register has not been reconciled with the bank. The All Clear? column is still blank, the Outstanding value is the same as the Book Balance, and the Bank Should Be entry is 0. See Figure 2 for an example of a reconciled register.

```
Check      Date       To         For             Check   Deposit        All   Balance
Number                                          Amount    Amount     Clear?   -------
----------------------------------------------------------------------------     0.00
           4/16       Deposit    startup                  700.00 *             700.00
  101      4/30       Asnj       lesson          27.90           *             672.10
  102      5/6        Cash                       59.00           *             613.10
           4/30       Deposit    paycheck                 345.00 *             958.10
  103      5/??       Cash                       99.00           *             859.10
  104      5/12       Filenes    shoes           38.00           *             821.10
           5/20       Deposit    paycheck                 345.00 *            1166.10
           5/21       Fbank      fee-check        7.43           *            1158.67
           6/15       Deposit    paycheck                 500.00              1658.67
                                                                              1658.67
                                                                              1658.67
                                                                              1658.67
                                                                              1658.67
                             Book Balance 1658.67
                              Outstanding 500
                           Bank Should Be 1158.67
```

Figure 2. The check register has now been reconciled with the bank. The All Clear? column shows an asterisk for each check and deposit that I found on the statement. The Outstanding Amount column, which I normally don't bother printing, shows a net value for each uncleared transaction.

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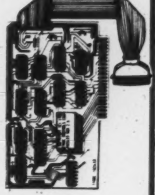

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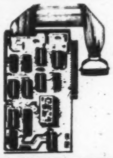

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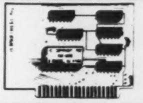

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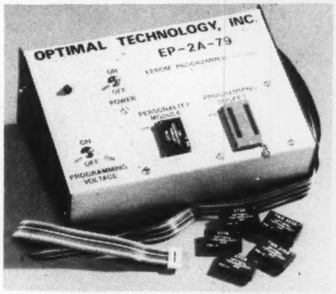

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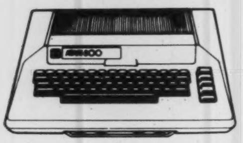

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outpost : atari
ATARI 800

John Anderson

Welcome to the "Outpost," fellow Atarians. I trust your power lights are on, and you are ready for another excursion into the realm of the Atari Personal computer—a machine with as many possibilities as your imagination can provide. We shall examine just a few of those possibilities here.

First, a quick word to all who have been in touch, as well as those who are thinking about it: keep those cards and letters coming in! I have very much enjoyed hearing from you, and am attempting to aim the content of this column to answer your questions, and cater to your interests. The only way I can effectively continue this policy is if I hear from you. So let me now what material you would like to see, and I will do my best. Okay?

Let's get right on to the matters at hand, beginning with program title card generation for your many programming treasures.

Super Text Mode

After a program is written and debugged, it should be cleaned and polished. When you think of all the work you did to get it working, the least you can do is mount it well—and that entails making it look and run right.

The first display a program generates is supremely important, as it sets the tone for all that is to follow. If you have been wanting a professional quality title card to distinguish your programs, here is a routine that will fill the bill. It can be tailored to display your message in a large, custom font, and then to cycle through a veritable rainbow of color. From there, another message can flash into the text window. After the title card has cycled fully, the rest of your program will execute.

Programs that plot and fill character sets into a non-text mode (in this case graphics 7) have appeared in *Byte,* and *Compute!* over the past two years. The routine that follows has some new features, and allows you to create your own, customized displays with a minimum of fuss.

If you are short on memory for a specific application, or don't have a disk drive, you might not want to commit many lines of Basic to the likes of this routine. However if you have a disk, the program can run as a separate file, invoking your main program file as its final act. It takes about 50 sectors on disk, and is well worth every bit of that space.

The routine appears in Listing 1. I have left the code relatively free of REM statements to conserve memory. If typed in exactly as shown, the program will display the letters A through U on the screen, cycle through the rainbow and text window displays, and then start all over. In order to display letters V through Z, change line 120 to RESTORE 862. This will at least give you a view of all the letters in the font, so you can ensure that the program has been entered correctly. The only reason the alphabet has been split in this manner is because the screen is capable of displaying only three rows of seven characters at one time.

The program breaks down as follows:

Line 10 initializes, while POKE statements suppress the cursor and move the margins out to 40 columns. It also invokes two subroutines: the first reads machine language data into a string which will then execute the rainbow segment from a USR call in line 30. The second subroutine reads data which define the placement and choice of characters.

Lines 50 through 70 constitute the secondary message, which will appear in the text window. There is no reason why this font, which is in graphics 0, could not be modified, perhaps along the lines of the program that appeared in the "Outpost" last month.

Line 80 creates a pregnant pause, then starts the whole procedure over again. Before it does so, however, it POKEs the attract mode into operation. You may or may not like the effect this creates, but the command shows that color background capability is there. This is also the line from which the rest of another program would take off.

Lines 130 through 230 are really the heart of the program, and exemplify a powerful and efficient manner of reading plotting (as well as other) information from an upcoming series of DATA statements. This handsome approach has appeared in *Compute!,* though I have improved upon it here.

Briefly, the following happens when reading DATA statements: if preceded by a P, upcoming data pertains to plotting. Read the numbers, PLOT and DRAWTO as necessary.

If preceded by an R, the following data will indicate where the plot should begin (always at the 0,0 point of any letter). These numbers always occur at the outset of a letter plot, and must be manipulated by the user in order to ensure correct placement. The font is "proportionally spaced"; for example, an I is narrower than an M, and care must be taken to lay out words so that spacing between letters is pleasing. Shades of art direction! The first number is the vertical coordinate, the second the horizontal. And remember, the Atari does *not* use the Cartesian coordinate system, but rather places 0,0 at the upper left-hand corner.

If preceded by an S, the data pertain to sound statements. Thus the user can create a tone for each letter, building into and moving between chords, if so

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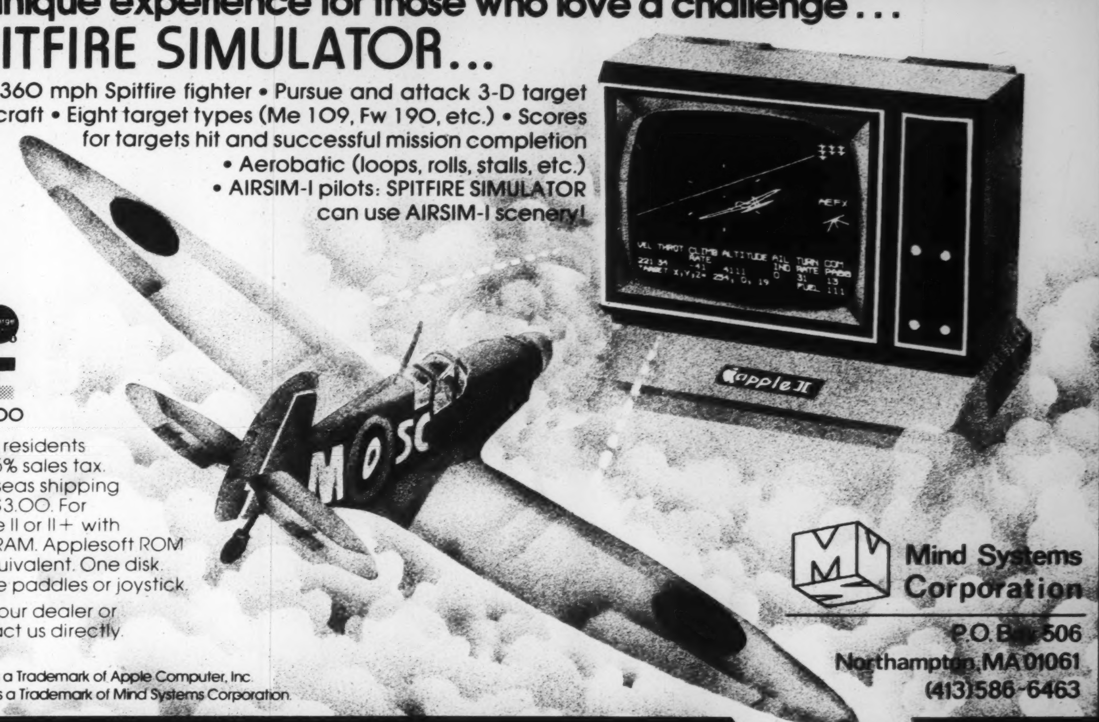

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desired, by cycling voices. The first number indicates which voice to use, the second what pitch. I worked exclusively with pure tone (10). By altering the distortion value in line 160, you can experiment with sound effects.

The next data identifier may seem a bit mysterious, as it is not used in the demonstration version of the program. It is a dummy identifier, placed there only for possible use as a time delay. As certain letters require fewer steps to draw than others (I as opposed to S, for example, they will plot much more quickly. By padding the DATA statements for the letter I with D's, you would be able to even out its plot time, to create a truly professional-looking display.

If preceded by a letter F, the numbers indicate a following fill statement. These ensure that the insides of each character will be delineated from the outside, so that the rainbow can then well up from within. And if the word END is encountered, the job of this section of code is terminated.

What follows are the somewhat lengthy DATA statements themselves. "Why the jump from line number 230 to 650?" the more observant Atarians out there may ask. "Well, for a good reason," I respond. The line numbers that initiate each letter correspond exactly to their ATASCI code times 10.

An observant but somewhat slower subgroup might ask as a follow-up, "so what?" Well I'm glad you asked that question. In a subsequent version of this program, (which I haven't yet written because I am hoping one of you will do it for me), the user will be able to input an entire message into a character string, and through the use of techniques outlined in the December "Outpost," the program will then *modify* itself into the specific message, deleting all extraneous material.

A hint at a possible approach: 1) find out what letter the user wants, 2) LIST CHR$ (user's letter) *10+2, give it a new line number (how about that gap between lines 230 and 650), then re-enter the line. Do this for +4, +6, and +8, and you will have the entire letter re-entered. Preset R (origin) and S (sound) values that the user can fiddle with later. There will be plenty of time for that, what with the time saved not having to edit the whole thing by hand. Then have the program automatically delete lines 650 through 904 completely. Voila, a custom title card, in minimal memory.

I'll go so far as to spice the deal—the first group of programmers to meet this challenge with a running, self-modifying title card generator, will get a shot at reviewing new Atari software for *Creative*—software we will supply and

Listing 1.

```
10 CLR :POKE 752,1:DIM D$(3),C$(32):TI
ME=10:POKE 82,0:GOSUB 1000:GOSUB 100
20 C$(15,15)=CHR$(22)
30 X=USR(ADR(C$),TIME)
40 GRAPHICS 7+32:POKE 752,1:SETCOLOR 2
,0,0
50 ? "--------------------------------
-------"
60 ? "--OUTPOST ATARI---CREATIVE COMPU
TING--"
70 ? "--------------------------------
-------"
80 FOR I=1 TO 2500:NEXT I:POKE 77,254:
GOTO 10
90 REM BRANCH HERE TO REST OF CODE
100 GRAPHICS 23:SETCOLOR 0,0,0:SETCOLO
R 1,0,14:SETCOLOR 2,0,0:SETCOLOR 4,0,0

110 COLOR 2:FCOLOR=1
120 RESTORE 650
130 READ D$:IF ASC(D$)<64 THEN 220
140 IF D$="P" THEN READ ROW,COLUMN:GOS
UB 230:PLOT COLUMN,ROW:GOTO 130

150 IF D$="R" THEN READ RORIGIN,CORIGI
N:GOTO 130
160 IF D$="S" THEN READ VOICE,PITCH:SO
UND VOICE,PITCH,10,6:GOTO 130
170 IF D$="D" THEN 130
180 IF D$="END" THEN RETURN
190 IF D$<>"F" THEN GOTO 130
200 READ ROW,COLUMN:GOSUB 230:POSITION
 COLUMN,ROW:POKE 765,FCOLOR
210 XIO 18,#6,0,0,"S:":PLOT COLUMN,ROW
:GOTO 130
220 ROW=VAL(D$):READ COLUMN:GOSUB 230:
DRAWTO COLUMN,ROW:GOTO 130
230 ROW=ROW+RORIGIN:COLUMN=COLUMN+CORI
GIN:RETURN
650 REM "A"---------------------------
-
652 DATA R,0,0,S,0,1
654 DATA P,2,7,2,13,4,16,6,18,8,19,25,
19,25,13,F,19,13,P,6,9,F,6,11,F,7,12,F
,8,13,F,13,13,13,7

656 DATA 8,7,7,8,6,9,P,19,13,19,7,25,7
,25,1,F,8,1,F,6,2,F,4,4,F,2,7,2,13,P,1
3,7,8,7,7,8,6,9
660 REM "B"---------------------------
-
662 DATA R,0,22,S,1,7
664 DATA P,2,1,2,13,4,16,6,18,8,19,10,
19,12,17,13,15,15,17,17,19,21,19,23,17
,25,15,25,1
666 DATA P,6,7,F,6,11,F,8,13,F,10,11,1
0,7,6,7,P,15,7,F,15,11,F,18,13,F,20,11
,20,7,16,7,P,25,1,F,2,1
670 REM "C"---------------------------
-
672 DATA R,0,44,S,2,11
674 DATA P,2,7,2,13,4,16,6,18,8,19,8,1
3,F,6,11,F,6,9,8,7,19,7,21,9,P,19,19,2
1,19,23,16,25,13
676 DATA P,21,9,F,21,11,F,19,13,19,19,
P,25,13,25,7,F,23,4,F,21,2,F,19,1,F,8,
1,F,6,2,F,4,4,F,2,7

680 REM "D"---------------------------
-
```

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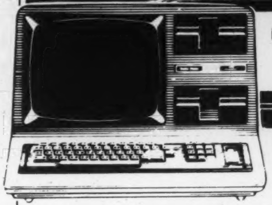

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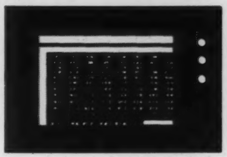

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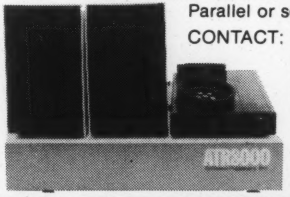

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Disk Utilities

Want to learn more about how your disk drives work? Need a way to retrieve data from crashed disks? Want to look at and alter disk information sector by sector? Interested in backing up your disks? If your answer to any of these questions is yes, you are a candidate for a disk utility package.

Every time I have been about ready to write something on disk utilities, another package makes makes its appearance. The latest I have had a chance to become acquainted with is *Diskey* from Adventure International. This packs the most features I have yet seen in a disk utility, and is accompanied by a rare bonus: sparkling, well-written documentation by the software author himself. The tutorial value of the manual alone makes the package worthwhile.

But just wait until you see the software. Disk maps are presented simultaneously in hexadecimal and ASCII format. The software allows for sector-by-sector data examination and alteration. It provides tools by which to salvage damaged disks. It provides functions to compare, copy, reformat, search, create disk files from tape autoboot files, erase (write zeros), disable verify, calibrate drive speed, and manipulate disk directories as well as DOS files.

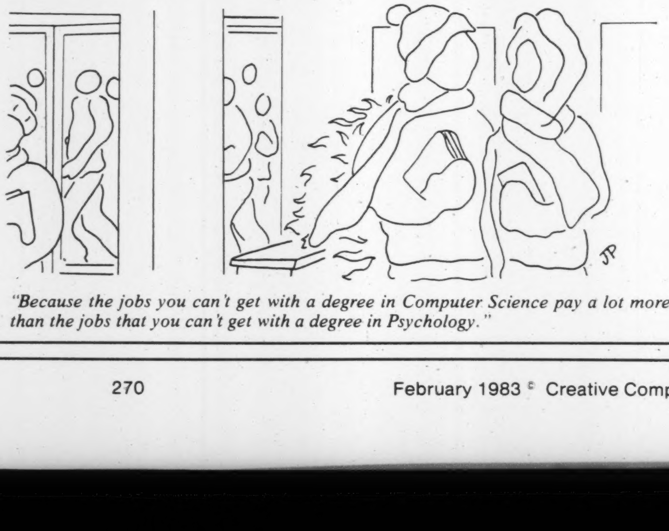
Another unique function of *Diskey* is its ability to flag "dead" disk sectors. This is a capability previously unavailable in any disk utility I have seen. Though the potential for misuse is there, author Sparky Starks stops short of spelling out a means to write bad sectors. He states strongly in the manual foreword his equation of software pirates with common thieves.

As a learning tool, *Diskey* is superlative. The documentation and software work in tandem to provide the most solid disk tutorial you can find anywhere. And, hard as it may seem to imagine, even the driest stuff is presented in a fresh, almost breezy manner.

Diskey is more than a professional utility: it is obviously a labor of love. There are many more features in the software than would have been necessary to create a salable package. For over 50 reasons (the product has over 50 separate commands), *Diskey* very quickly attained a pre-eminent position in my utilities box. How about an assembly language tutorial, Mr. Starks?

Obviously, you must have a disk drive to run the package; in addition, you must have at least 32K and Atari Basic. The system is optimally configured,

```
682 DATA R,0,66,5,3,13
684 DATA P,2,1,2,13,4,16,6,18,8,19,17,
19,21,19,23,17,25,15,25,1,P,6,7,F,6,11
,F,8,13,F,18,13,F,20,11,20,7,6,7
686 DATA P,25,1,F,2,1
690 REM "E"---------------------------
-
692 DATA R,0,88,5,0,15
694 DATA P,2,1,2,19,8,19,8,7,11,7,11,1
5,16,15,16,7,19,7,19,19,25,19,25,1,F,2
,1
700 REM "F"---------------------------
-
702 DATA R,0,110,5,1,18
704 DATA P,2,1,2,19,8,19,8,7,11,7,11,1
5,16,15,16,7,25,7,25,1,F,2,1
710 REM "G"---------------------------
-
712 DATA R,0,132,5,2,23
714 DATA P,2,7,2,13,4,16,6,18,8,19,8,1
3,F,6,11,F,6,9,8,7,19,7,21,9,P,19,19,2
1,19,23,16,25,13
716 DATA P,18,19,14,19,14,11,F,18,11,F
,18,13,F,19,13,F,21,11,21,9
718 DATA P,25,13,25,7,F,23,4,F,21,2,F,
19,1,F,8,1,F,6,2,F,4,4,F,2,7
720 REM "H"---------------------------
-
722 DATA R,25,0,5,3,28
724 DATA P,2,13,2,19,25,19,25,13,F,16,
13,P,2,7,11,7,F,11,13,F,2,13,P,16,13,1
6,7,25,7,25,1,F,2,1,2,7
730 REM "I"---------------------------
-
732 DATA R,25,28,5,0,31
734 DATA P,2,1,2,7,25,7,25,1,F,2,1
740 REM "J"---------------------------
-
742 DATA R,25,44,5,1,38
744 DATA P,2,13,2,19,20,19,21,18,23,16
,25,13,25,7,P,2,13,F,18,13,F,20,12,F,2
1,9,19,7,F
746 DATA 19,1,F,20,1,F,22,2,F,23,4,F,2
5,7
750 REM "K"---------------------------
-
752 DATA R,25,66,5,2,42
754 DATA P,2,1,2,7,11,7,P,19,19,13,14,
8,19,2,19,2,13,F,8,13,F,11,7,P,19,19,2
5,19,25,13,F,19,13,F,16,7,25,7
756 DATA 25,1,F,2,1
760 REM "L"---------------------------
-
```



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Poking Around

This part of the column was initiated as an attempt to respond to the many questions we have received at the magazine concerning Atari memory map locations, and ways of "tweaking" them.

I have at least three letters from Atari Basic hobbyists, all asking the same question: how can Basic programs be made unlistable? First of all, let me go on record as one of the category of folks who believe in keeping things listable wherever and whenever it is feasible to do so. The problem of code theft is not nearly as acute in Basic as it is in machine language, nor is that diehard pirate going to be deterred by the mere fact that a program is unlistable in its usual environment. My feeling is, in the spirit of enlightenment, if other people stand to learn something from a bit of my code, more power to them.

That disclaimer having been duly filed, let's look at the only tried, true, and simple method I have seen to help protect your precious Basic files from prying eyes.

Most approaches I have seen to rendering Basic programs unlistable are unsatisfactory. Last month I noted the memory locations you can alter to disable the BREAK key. (A quick aside—a couple of folks wrote in telling me they experienced problems disabling BREAK. The POKE commands must be reasserted often. For instance, POKE again after every graphics mode command. If you put enough sets of them in your program or stick them right places in the main loops, you will effectively disable the key.)

I have not found a way to disable the RESET key, but with the command POKE 580,1 you can make the key into a "true" reset: that is, pressing the key will initiate a cold start, as if the system has been powered down and up again. This will flush any resident program from memory. To return to the normal RESET mode, POKE 581, 1.

The trouble with merely disabling these keys is that the program can still be listed before it is ever run. Still another approach I have seen converts program listings into control characters or variables into carriage returns. Likewise, the fixes do not become operative until the programs are run. If the user asks for a LIST directly after loading, a full listing will be obtained.

```
762 DATA R,25,88,5,3,47
764 DATA P,2,1,2,7,19,7,19,19,25,19,25
,1,F,2,1
770 REM "M"---------------------------
-

772 DATA R,25,110,5,0,57
774 DATA P,2,1,2,7,5,10,2,13,2,19,25,1
9,25,13,F,10,13,13,10,F,10,7,25,7,25,1
,F,2,1,2,7,6,10,F,4,11,F,3,12,F,2,13
780 REM "N"---------------------------
-

782 DATA R,25,132,5,1,63
784 DATA P,2,1,2,7,8,13,2,13,2,19,25,1
9,25,13,F,19,13,F,13,7,25,7,F,25,1,F,2
,1,2,7,9,13,F,2,13
790 REM "O"---------------------------
-

792 DATA R,50,0,5,2,76
794 DATA P,2,7,2,13,4,16,6,18,8,19,19,
19,21,18,23,16,25,13,P,8,7,6,9,F,6,11,
F,8,13,F,19,13,F,21,11,21,9,19,7,8,7
796 DATA P,25,13,25,7,F,23,4,F,21,2,F,
19,1,F,8,1,F,6,2,F,4,4,F,2,7
800 REM "P"---------------------------
-

802 DATA R,50,22,5,3,86
804 DATA P,2,1,2,13,4,16,6,18,8,19,13,
19,15,18,17,16,19,13,P,6,9,F,6,11,F,7,
12,F,8,13,F,13,13,13,7
806 DATA 8,7,7,8,6,9,P,19,13,19,7,25,7
,25,1,F,2,1
810 REM "Q"---------------------------
-

812 DATA R,50,44,5,0,96
814 DATA P,2,7,2,13,4,16,6,18,8,19,19,
19,21,18,23,16,P,8,7,6,9,F,6,11,F,8,13
,F,19,13,F,21,11,21,9,19,7,8,7
816 DATA P,23,16,27,19,29,16,F,25,13,F
,25,7,F,23,4,F,21,2,F,19,1,F,8,1,F,6,2
,F,4,4,F,2,7
820 REM "R"---------------------------
-

822 DATA R,50,66,5,1,103
824 DATA P,2,1,2,13,4,16,6,18,8,19,10,
19,12,17,13,15,15,17,17,19,25,19,25,13

826 DATA P,6,7,F,6,11,F,8,13,F,10,11,F
,10,7,6,7
828 DATA P,25,13,F,22,13,F,19,12,F,18,
9,18,7,25,7,25,1,F,2,1
830 REM "S"---------------------------
-

832 DATA R,50,88,5,2,115
834 DATA P,2,7,2,13,4,16,6,18,8,19,8,1
3,F,6,11,6,9,8,7,10,9,10,13,12,16,14,1
8,16,19
836 DATA 19,19,21,18,23,16,25,13,25,7,
P,17,7,19,9,F,19,11,F,17,13,F,15,11,F,
15,9
838 DATA P,25,13,F,25,7,F,23,4,F,21,2,
F,19,1,F,17,1,17,7,P,15,9,F,14,7,F,12,
4,F,10,2,F,8,1,F,6,2,F,4,4,F,2,7
840 REM "T"---------------------------
-

842 DATA R,50,110,5,3,128
844 DATA P,2,1,2,19,8,19,8,13,25,13,25
,7,F,8,7,8,1,F,2,1

850 REM "U"---------------------------
-
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Outpost: Atari, continued...

How then, to protect a program before it can be listed? The answer lies in the creation of a "RUN only" file. This type of file can not be LOADed or ENTERed, nor can it ever be LISTed. It executes perfectly in every other respect, but can only be invoked with the command RUN"D:FILENAME", (or RUN "C:" if you are using a cassette-based system). In order to create such a file, append the following line:

```
POKE PEEK ( 138)+256*PEEK
( 139)+2,0:SAVE''D:FILE-
NAME'':NEW
```

It does not matter if the line is at any time executed by the main program; the code therefore remains unaffected in any way. It is imperative, however, that the line be the chronologically last line of code. When you are ready to protect a program (that is, do not intend to alter it any further), type this line with a higher line number than any other in the program, choose a filename, than GOTO the line. Listing 2 is a working example.

That is all there is to the technique: "RUN only" files can be simply generated to disk or tape. Attempts to do anything other than RUN will result in a nasty case of system lock-up. And yes, even autorun files can be protected in this manner.

Scuttlebytes

Well, we have finally managed to confirm the existence of the *Atari 600,* and have heard that at least two Atari plants are currently tooling up to produce them. The 600, as its model number implies, will fill the gap between the Atari 400 and 800., It was rumored that the machine would be unveiled at the Winter CES in Las Vegas. It will sport 48K standard, and a full-stroke keyboard. Owners of 400s and 800s need harbor no fears of obsolescence: the 600 will be completely compatible with its predecessors.

Many Atari types are awaiting with curiosity the final verdict on the Commodore 64, which features graphics, sound, and gaming capilities very much akin to those of Atari computers. Atari has, in the meantime, added to its busy legal docket a suit against Commodore, concerning the design implementation of Commodore joysticks, which are for use with the VIC-20 and all latest generation machines. It seems the sticks are not only Atari-compatible, but nearly identical in many respects.

Atari, which patented its stick when the VCS was first introduced in 1977 and improved the design several times since, claims patent infringement. The

```
852 DATA R,50,132,5,0,146
854 DATA P,2,13,2,19,19,19,21,18,23,16
,25,13,25,7
856 DATA P,2,19,2,13,19,13,F,21,11,21,
9,19,7,2,7,2,1,P,25,7,F,23,4,F,21,2,F,
19,1,F,2,1
858 DATA P,20,13,F,2,13
859 DATA END
860 REM "V"----------------------------
-
862 DATA R,35,25,5,0,153
864 DATA P,2,1,2,7,14,7,16,9,16,11,14,
13,2,13,2,19,17,19,25,11,F,25,9,F,17,1
,F,2,1
866 DATA P,16,9,F,16,11,F,14,13,F,2,13

870 REM "W"----------------------------
-
872 DATA R,35,47,5,1,172
874 DATA P,2,1,2,7,19,7,16,10,19,13,2,
13,2,19,25,19,25,13,F,22,10,25,7,25,1,
F,2,1
876 DATA P,16,10,F,19,7,P,2,13,F,19,13

880 REM "X"----------------------------

882 DATA R,35,69,5,2,191
884 DATA P,2,1,2,7,9,10,2,13,2,19,8,19
,13,15,19,19,25,19,25,13,F,18,10,25,7,
25,1,F,18,1,F,13,5,F,8,1,F,2,1
886 DATA P,10,10,F,2,13
890 REM "Y"----------------------------
-
892 DATA R,35,91,5,3,205
894 DATA P,2,1,2,7,9,10,2,13,2,19,8,19
,13,15,16,13,25,13,25,7,F,16,7,F,13,5,
F,8,1,F,2,1
896 DATA P,10,10,F,2,13
900 REM "Z"----------------------------
-
902 DATA R,35,113,5,0,255
904 DATA P,2,1,2,19,8,19,19,10,19,19,2
5,19,25,1,F,19,1,F,8,10,8,1,F,2,1
1000 DATA END
1010 RESTORE 1040
1020 FOR I=1 TO 32:READ C:C$(I)=CHR$(C
):NEXT I
1030 RETURN
1040 DATA 104,104,104,72,162,57,160,0,
173,0,210,101,20,141,22,208,141,10,212
,136,208,242,202,208,237,104
1050 DATA 56,233,1,208,228,96
```

Listing 2.

```
10 ? "THIS PROGRAM IS UNLISTABLE"
20 ? "EVEN THOUGH THE RESET AND"
30 ? "BREAK KEYS REMAIN ENABLED."
40 ?
50 ? "TRY IT!"
60 FOR X=1 TO 1000:NEXT X
70 GRAPHICS 0:GOTO 10
80 REM REMEMBER TO "GOTO 10000"
90 REM TO SAVE THE UNLISTABLE FILE!
10000 POKE PEEK(138)+256*PEEK(139)+2,0
:SAVE "D:OUTPOST":NEW
```

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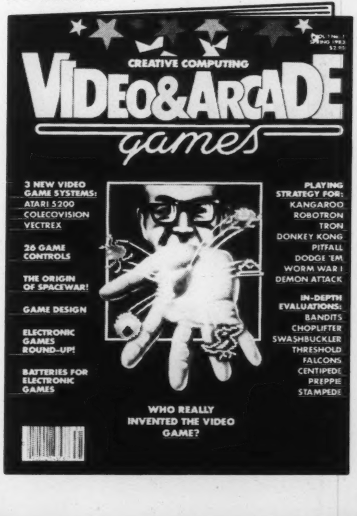
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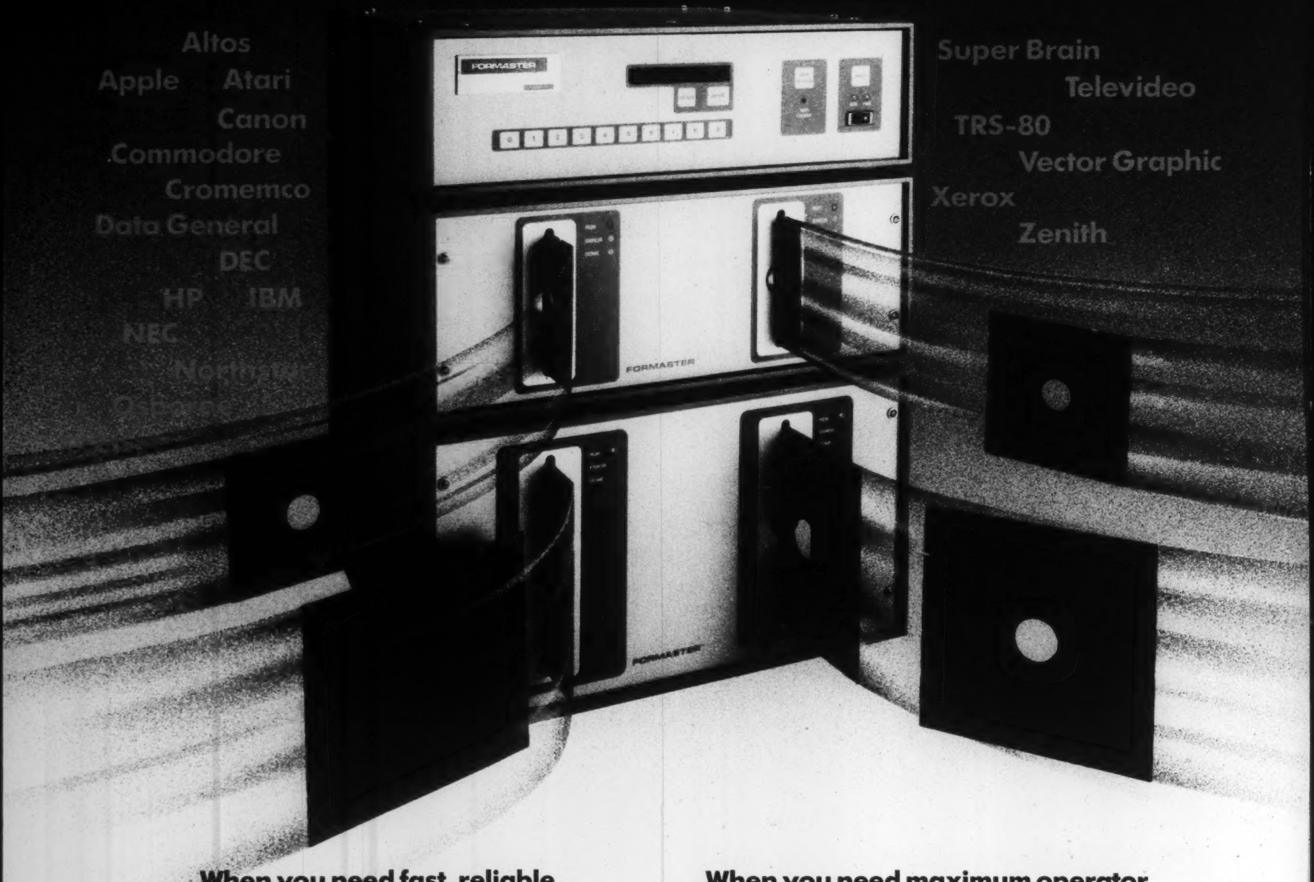
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CIRCLE 195 ON READER SERVICE CARD

Outpost: Atari, continued...

Atari joystick connector has set an informal design standard in the industry. The Colecovision videogame uses an Atari-compatible format, and it was rumored that the new microcomputer, to be released by Apple this year will also make use of Atari-compatible digital sticks. But compatibility and patent infringement are two separate concepts.

Joysticks

While we're on the topic of joysticks, let me tell you about two hot sticks we've been playtesting. The first is the Pointmaster joystick. This stick has an extra long handle with built-in grip and handle-mounted trigger button, making it perfect for "flyer" games like *Star Raiders* and *Protector II.* The stick is very much like the one in the stand-up arcade version of Zaxxon, and once you play a few games of *Raiders* with it, you won't want to use anything else. Conversely, the stick is cumbersome in maze games like *Jawbreaker* or MBAFAS ("move back and forth and shoot") games like *Threshold.* Still, at $17.95, it offers a real boost to your "flyer" game collection.

For more information, contact Discwasher, 1407 North Providence Road, Columbia, MO, 65201. (314) 449-0941.

The other sticks we looked at, called Game Mate 2, are pretty nearly regulation Atari sticks, with one big difference: they are wireless, and work by remote control. My main fear was that there would be a time lag between the movement of my hand and what I saw on the screen. I experienced no such sensation—the sticks seemed as fast as any I had ever tried. My only reservation is their size. They are quite bulky, and take a while to get used to.

With the VCS, the console power supply plugs into the Game Mate receiver unit, and then into the VCS console. For the 400 and 800 computers, however, an additional 9-volt power supply is a necessary purchase. Each stick also takes a 9-volt transistor battery. The units operate at distances of up to 20'.

Complete with receiver and two sticks, Game Mate 2 lists for $99.95, but I have already seen this price substantially discounted. If the luxury of wireless sticks is appealing to you, this product will assuredly not disappoint.

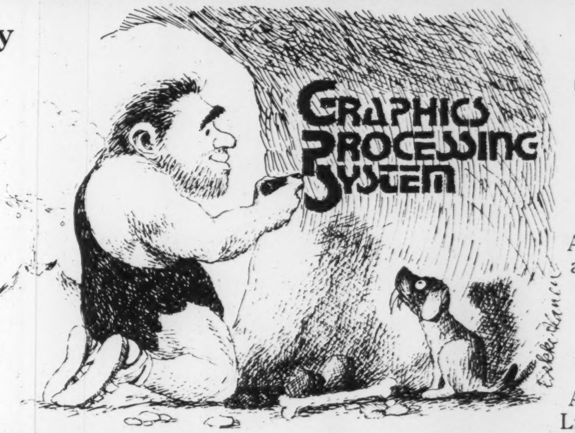
For more information, contact Cynex Manufacturing Corporation, 28 Sager Pl., Hillside, NJ, 07205. (201) 399-3334.

Games

Smoothly we seque from sticks to the games played with them. We have confirmed 400/800 versions of *Galaxian* and *Defender* in ROM form from Atari. Both games are spin-offs from the new 5200 model videogame. The 5200 may yet prove to be a boon to owners of Atari computer systems, if it spurs game development common to all machines. *Galaxian* has already been demonstrated, and is a solid implementation. One can only hope that *Defender* will be up to snuff.

Datasoft also has an ambitious project on its drawing boards right now: *Zaxxon* for the Atari. We can't wait.

I must admit it: when I first heard that Big Five Software was releasing a game for Atari, I sort of chuckled. Somehow I assumed that because *Miner 2049*'er was from one of the best TRS-80 game houses, it would probably run in graphics 5. Did I make a mistake. *Miner 2049'er*, in ROM cartridge format, is bound to be one of the runaway hits of the year. With superlative graphics, humor, and 10 completely different screens to master, the game leaves Colecovision's *Donkey Kong* pale by comparison. ☐



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CIRCLE 287 ON READER SERVICE CARD

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Will Fastie

I enjoy writing "Images," and it's been nice to get so many encouraging letters. In November, however, I blew it. This month my readers let me know it—so much for fame and fortune.

The problem was my benchmarked study of languages for the PC. Although mostly accurate, my work could have been somewhat more complete and I did, in fact, make a few mistakes. I think all the language system manufacturers deserve fair treatment, so I've completed the study and corrected my mistakes. Table 1 is a new list of the language systems tested, and the results of the compilation, linkage, and execution of the Sieve of Eratosthenes Prime Number program.

My first oversight was pointed out by a reader from New Jersey, James Holtman, who wrote to tell me that my time for IBM Pascal was accurate but misleading. Mr. Holtman correctly pointed out that Pascal does a considerable amount of run-time checking, especially in the Sieve because of the array references. In his version of the program, Mr. Holtman included a compiler directive to disable the checking and obtained a time of 10 seconds, considerably faster than my reported 76 seconds and also faster than the fastest time I recorded. I modified my version to include the directive and obtained a time of 12 seconds. The difference in time is explained by a slight difference in the two versions: in mine, a loop is used to initialize the array while Mr. Holtman calls the library routine FILLC. The times are excellent in either case, but FILLC is obviously a better approach. Sincere thanks to Mr. Holtman for his insight.

One thing is still true of Pascal: the executable file is very large at over 32,000 bytes. Only Fortran was larger, and it was twice the size.

Also on the subject of Pascal, Professor Scott Owen from Atlanta University wrote to tell me of his Sieve benchmarks of the UCSD p-system. The p-code version (that's an interpreted version) ran in 188 seconds in Pascal. A native code version (complied for the 8086/88) re-

Language System	Object File Size	Executable File Size	Execution Time (secs)
IBM Basic-single precision (Interpreted)	—	—	2430
IBM Basic-integer (Interpreted)	—	—	2020
IBM Fortran	2079	68736	777
IBM Basic-single precision (Compiled, uses BASRUN.EXE)	1267	1536	315
IBM Basic-single precision (Compiled standalone)	1709	19072	220
IBM Pascal (with run-time checking)	1015	32640	76
PC/Forth	—	—	56
C86	512	9572	22
Janus (no run-time checks)	1024	10240	18
IBM Basic-integer (Compiled, standalone)	1282	18432	16
IBM Basic-integer (Compiled, uses BASRUN.EXE)	1141	1536	15
IBM Pascal (no run-time checks)	807	32512	12
Lattice C	8777	19072	11

Table 1. Sieve of Eratosthenes Benchmark Results (Revised).

W. H. Fastie, 7110 Sheffield Road, Baltimore, MD 21212. Correspondence can only be acknowledged when a stamped, self-addressed envelope has been provided.

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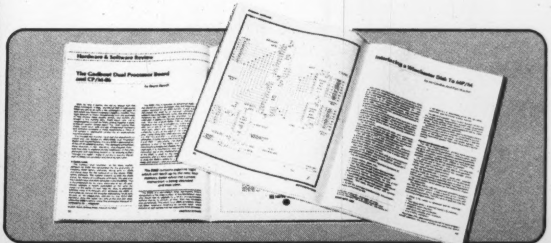

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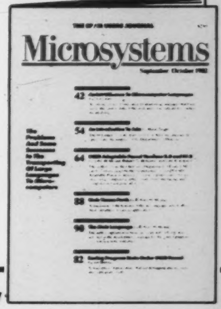

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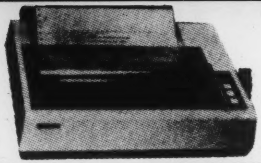

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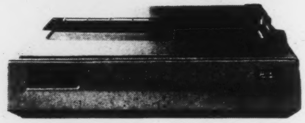

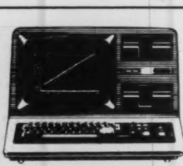

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quired 49 seconds. Professor Owen also benchmarked Fortran, but had to change the program to avoid a LOGICAL test. That version executed in 280 seconds, and a Pascal version revised to match the Fortran change required 288 seconds.

Professor Owen was rather excited about the performance. But he also wanted to point out that the UCSD p-system comes with a built-in full-screen editor which he considers excellent. He correctly points to the total integration of the p-system, and to the full compatibility with other hardware environments, such as Apple.

Let me digress for a second. The Professor was, I think, a little hurt that I did not include the p-system in my evaluation. He wrote that I "ignored" it, and he is quite correct. Although I am familiar with the p-system (my department was an early licensee of UCSD), I do not think it is of broad general interest. Software developers are very interested, and rightly so. But the vast majority of users will not have the system due to its cost, and the vast majority of users will probably never use a system implemented with it. IBM has on several occasions offered my a review copy, but I have declined. My attention will continue to be focused on PC-DOS, because I contend that 95% of all IBM PCs will be installed with it.

I appreciate the work Professor Owen did to prepare and report the Sieve results for the p-system.

The second oversight was with Basic. In the version I used, the numeric precision defaulted to single precision floating point. If a DEFINT A-Z statement is added at the beginning of the program, dramatic improvements appear in the compiled version. Microsoft called me on this one. I think the results in Table 1 are self-explanatory, and really impressive. My statement in November that the Basic Compiler could improve performance was grossly understated in light of these new results.

I apologize to IBM and Microsoft for my misrepresentations. I hope none of you has been inconvenienced.

Other Language Issues

One language I failed to mention in November is Janus from RR Software. This language is a subset of Ada, the new "official" DOD language. I am not a fan of Ada, and I don't know the language very well, so I procrastinated. In the meantime, a new update arrived, and guilt set in.

From Table 1 you can see that the language system performed rather well. Both the size of the object module and the size of the executable file are reasonable by comparison, and the execution time is right up there. Ada, like Pascal, does extensive run-time checking, but the version of the Sieve I used (provided by RR Software as a sample package) included the necessary Pragmas (the Ada term for compiler directives) to disable the checks (I'll not make that mistake again!).

I am generally impressed with the professional level of effort RR Software has made with Janus. The system is complete and the document is above average. The manual will not teach you Ada, as the expected audience is knowledgeable programmers, but a list of books is provided as a guide to the primary references.

The system includes its own linker, assembler, and disassembler. Two versions of the compiler are supplied, one for single sided disks and one for double sided disks or hard disks. I think that's a little confusing, but the document contains explicit instructions, so it is not a problem.

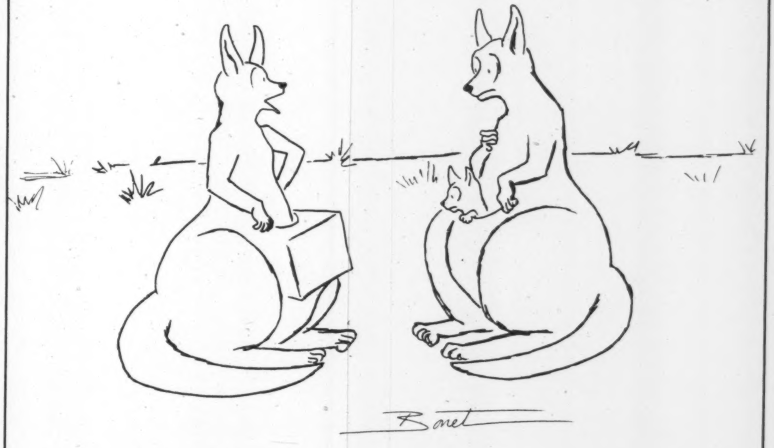
All this software is delivered on four disks. The installation procedure for single sided disks involves breaking out the files onto six disks for general use. This turns out to be very complicated, and took me about 90 minutes. The instructions were actually wrong on this point, because I needed seven disks. The main problem is that a given working disk may require files from more than one of the distribution disks, but the document does not describe which distribution disks are needed to construct each working disk. I found this very irritating, and I suggested to RR a way to automate the process. Granted, only experienced programmers are likely to use this system, but I think they will appreciate a quick and clear installation.

The product appears to be stable. Don't forget that this is a *subset* of Ada, so be careful if you are considering the language to meet a government requirement. Some of the more difficult Ada concepts are not implemented. For a complete review of Janus, see the January issue of *Creative Computing*.

I got an interesting call about the C compilers mentioned in November. Lattice called me to explain why their executable file was so large. They pointed me to the specification of C in the Kernighan and Ritchie book which says that uninitialized static and external arrays are guaranteed to be zero. Lattice thus builds the large array of the Sieve program as part of the object file and sets each entry to zero.

I wondered whether C86 from Computer Innovations was deficient in this regard, since the files were half the size of the Lattice files. George Eberhardt told me that his arrays are also guaranteed to be zero, but that the initialization takes place at execution time. This leads to a smaller file to keep on disk and a smaller file to load—important considerations on small floppy disks. I prefer the C86 approach. I just wish George would finish the code generator and optimizer; he will readily admit that his current code generation model leaves something to be desired.

I continue to be interested in C compiler technology, and I'll report on new compilers as I have the opportunity to test them. When I have five or six, I'll compare them all head-to-head. My interest stems from the fact that a very



"I don't mind his pocket computer, but now that he's added a Winchester drive and line printer, it's gotten a bit out of hand."

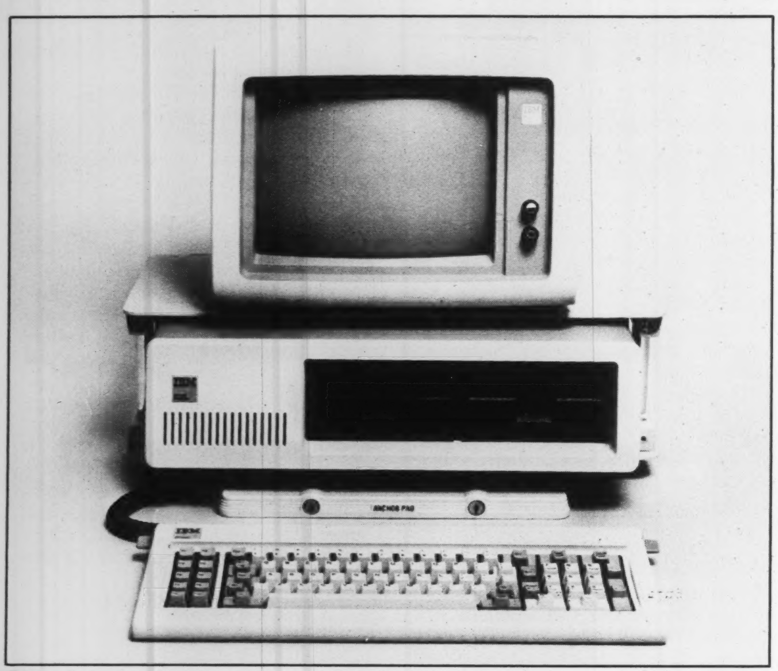


Photo 1 Anchor Pad International's Security System.

strong de facto standard exists for C, to the extent that programs written in the language are very portable. In addition, the language can be used in such a way that code generation is very good to excellent; the nature of C makes it ideal for systems programming.

Portability has been widely touted as a strength of Pascal, but my professional experience belies this. Every manufacturer's version of Pascal has a set of extensions designed to complement their machine and to implement separate compilation. This latter issue is important: the original definition of Pascal did not include a way to have more than a single source module (this was on purpose, by the way) and no generally accepted standard has emerged. The closest thing to a standard is the UCSD p-system, now marketed by SoftTech Microsystems.

News and Micro Reviews

What's a "micro" review, you say? Well, it's too small to be one of my famous "mini" reviews, that's all.

Here's an item that really should be in my "My Face Is Red" department, but I checked my notes and I reported accurately. A letter from Wang corrected my October pricing of two Wang products for the Professional Computer. I said that the 5Mb hard disk drive was $2000 and that *MultiPlan* was $500. These prices were given to me by a Wang representative in their booth at NCC. The correct prices are $3500 (what a disappointment!) and $300, respectively.

Anchor Pad International has announced the availability of their security product for the IBM PC. The device secures the PC to a surface to prevent theft. The manufacturer claims that a system so protected must be virtually destroyed before it can be removed from the restraint and then, of course, it loses its value to the thief. The three-tiered system shown in Photo 1 costs approximately $445 including installation. I had a look at this equipment at Comdex, and it is rugged.

There are several new programs from M.A.P. Systems, distributed by Indigo Data Systems, Inc. and available in Computerlands. One, *Print-It,* I have used, and I think it is the best screen dump program available. If you think back to the December column in which I reviewed a number of games, you will recall that sample pictures were included for most. These images were obtained from this screen dump program. What I like best is that it prints the entire character set from the Monochrome Display as well as graphics images from the Color/Graphics Adapter. The pro-

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(608) 244-6436

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Indigo Data Systems, Inc.
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Datamost
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Chatsworth, CA 91311
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Anchor Pad International, Inc.
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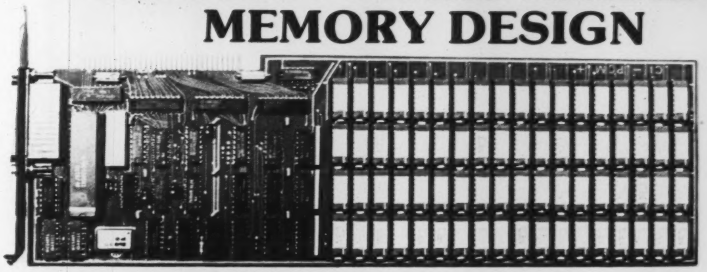

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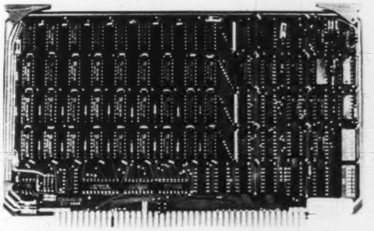

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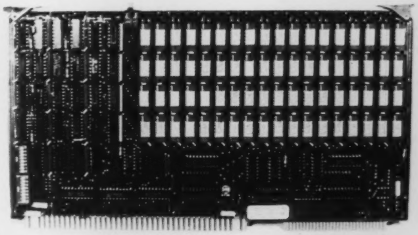

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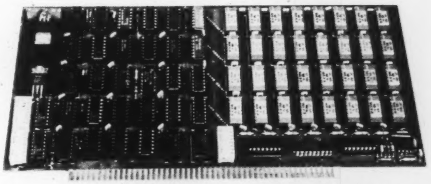

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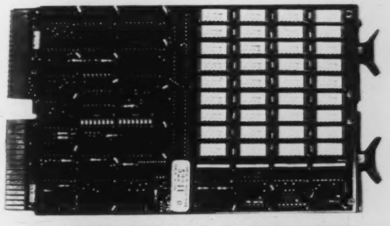

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gram becomes a permanent part of PC DOS and is invoked by pressing Shift PrtSc. Retail price is $44.95.

Two other M.A.P. System products are *Spool-It,* a printer spooler program at $44.95, and *Color-It,* at $49.95. The former product allows a section of memory to be set aside as a buffer for print requests. When you direct output ot the printer, it is written to this buffer and the computer is quickly freed for the next task while the spooler prints from the buffer. *Color-It* is a screen print program for the IDS 80 or 132 Prism printer that allows color images to be printed. I've seen some sample printouts, and they look great. The program will also support the IDS 460/560 with the bit graphics option for black and white dumps.

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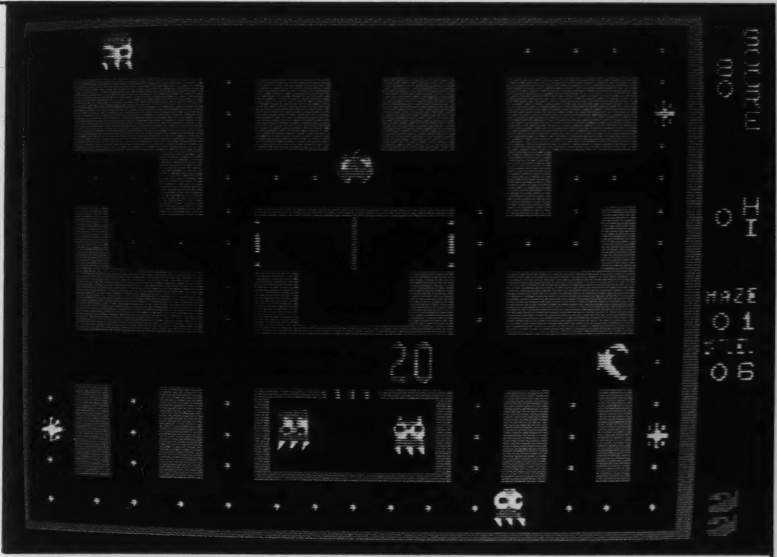
The Snacker Cometh



There's a new game on the block. Well, it's not exactly new. It's a game that has been around on the Apple for a while, and which has just been converted to the IBM PC. It is a hot seller on the Apple, ranking high on *Softalk's* bestseller list with a strong index. And as far as I'm concerned, it's the best arcade-style game currently available for the IBM PC. The game is *Snack Attack II.* It's a Pac-Man clone. It's addictive and tough. It's well-built. It's fun.

I liked it from the start. I took it onto work (at the moment, the PC In my office has a color monitor) and let the folks there play it. I had to send in the Marines to get the disk back out. I should have put a slot for quarters next to the PC!

The game is well-engineered. After the disk boots, a number from 1 to 6 is entered to select the level of play. The game has a high score list and an "attract mode" like an arcade game, and the program alternates between these two when no one is playing. The program allows either the keyboard or a joystick to be used, and the user can select any four keys on the keyboard (except the function keys) to be used as the controls. There are three different mazes which are played one after the other.

There are two slight problems with the game, and one enhancement that would be useful. Problem number one is the selection of keys built into the program. One might expect the arrow keys on the cursor keypad to be the logical choice, but the program comes set for A, Z, X, and C. Problem number two is that it is difficult to tell when the "snacker" is about to run out of energy, and this leads to some close calls, most of which go against the player. This lends some uncertainty to the game, which surprisingly serves to make it more interesting.

The enhancement is the ability to reset the high scores back to zero. This would allow a set of high scores that were not getting any higher to be removed so that players building from lower scores could record them. It's frustrating to play and never be able to have satisfaction of at least saving a score higher than your last one. *(Amen!-EBS)*

No question about it, though. This is a really good piece of software. It'll cost you $38.95, and although that seems high, I think you get good value. None of the 24 cartridges I own for the Atari VCS has the appeal of this game.

The game requires a 64K PC with the Color/Graphics Adapter and a disk drive. It is manufactured by Funtastic, Inc.

Controlling The Snacker

I have a Game Adapter and some jury-rigged joysticks. I also have the new TG Products joystick specifically built for the IBM, and I had good opportunity to test it while playing *Snack Attack II,* even though button depressions were not required.

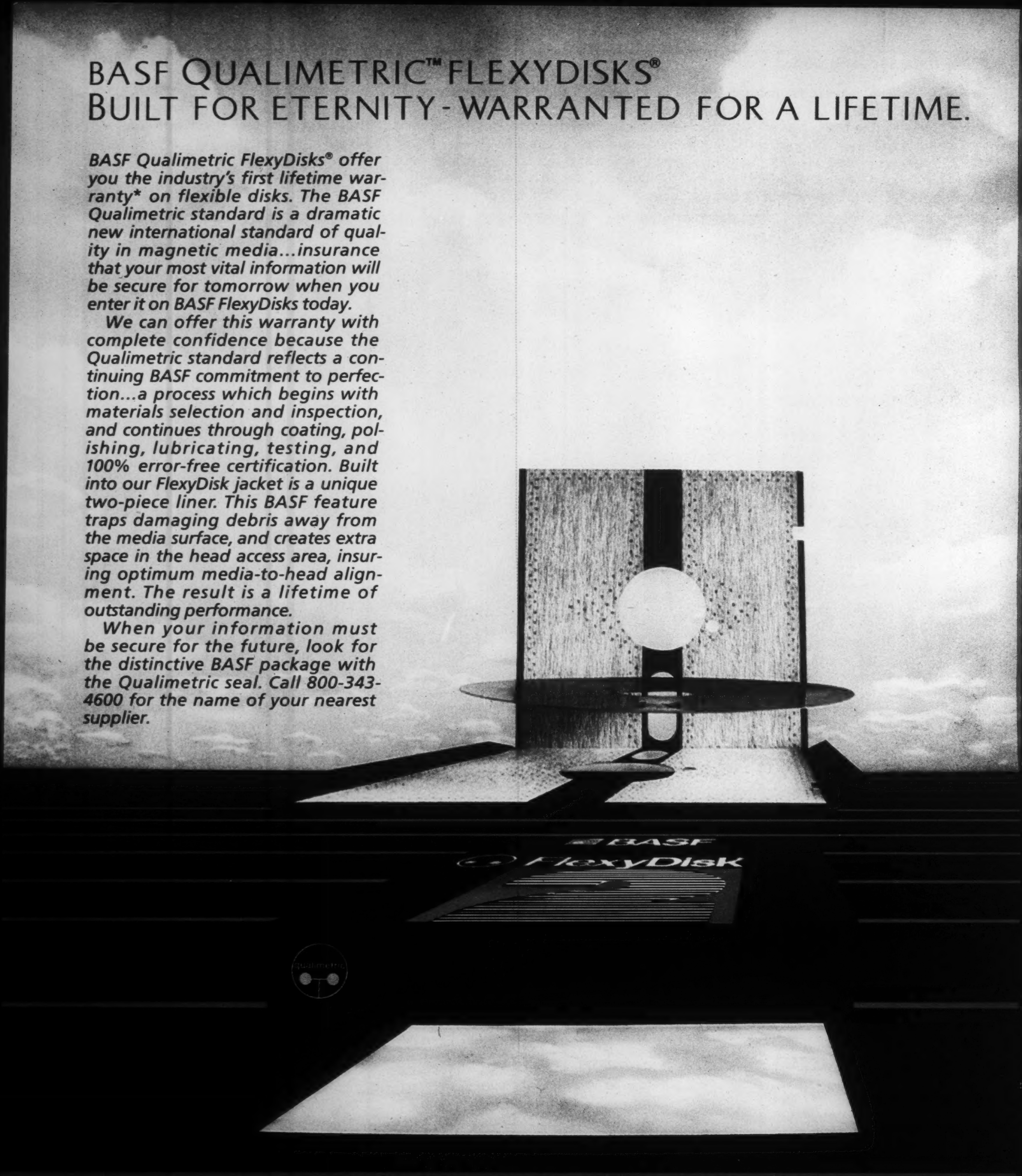
The joystick comes ready to go, with a nice cable and the correct connector. TG joysticks are self-centering, although they can be opened and the centering springs removed. For *Snack Attack II,* the automatic centering is absolutely essential. Without it, control of the snacker becomes much more difficult.

The joystick is a nice size, and can be comfortably held for long periods of time. It can also be set on a flat surface, held from slipping with one hand, and easily manipulated with the other. I found the length of the stick to be just right for my hands, which I think are of average size. The unit provides good feedback if the centering feature is enabled.

I did have a slight problem with the handle on the stick. It does not appear to be glued or otherwise secured, and I found it slipping up and almost off. I had to adjust the way I was holding it to compensate, but *Snack Attack II* requires so much action that I found the handle slipping no matter what I tried. A touch of glue will solve the problem, something TG should deal with in the manufacturing process. The joystick carries my recommendation even with this minor fault.

By the way, the highest score for *Snack Attack II* were attained under keyboard control, and not with the joystick.

And a final point. the IBM diagnostics expect both joysticks to be plugged in and will fail if you attempt to check out just one. A single joystick is a very likely circumstance. IBM should make an adjustment in their programs.



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announced some new products for the PC. The *PC/Forth Debugger* allows tracing and single-stepping of Forth programs, along with a dynamic display of the parameter and return stacks and the trace audit. Ten breakpoints are supported. *PC/GEN* is a utility program for the creation of new character fonts for the video display. The Color/Graphics Adapter is required. Finally, *PC/Forth+* is an upward compatible version of PC/Forth that removes the 64K address space restriction and allows the entire available address space of the 8088 to be used for dictionary space. No prices were available, and the products were to have been available by last November.

IBM announced some new products in October. Two payroll products were announced, one from Peachtree ($595) and one from BPI Systems ($425). The Peachtree Payroll system can post to the IBM Personal Computer Peachtree General Ledger. The BPI Payroll can post to the BPI General Accounting system and to another newly announced product, the BPI Job Cost ($550).

Also from IBM is a new game, *Adventure in Serenia* ($35) by On-Line Systems, Inc. In this adventure, the user has to save a captured princess who has been kidnapped by an evil wizard.

From Intelligent Statements comes *Ken Uston's Profe$$ional Blackjack.* This is the ultimate computerized blackjack game, and includes such amenities as the house rules for more than 70 major casinos and an extensive instruction manual which describes Mr. Uston's system. The program is designed to teach the user how to play winning blackjack; Mr. Uston made a fortune playing blackjack with his system.

Datamost has two games for the PC. The first is *Space Strike,* a Space Invaders clone which is pretty good. At the higher levels of play it is tough. The other is *Pig Pen* which I found somewhat boring. A Pac-Man variant, the object is to *leave* dots behind and avoid being slaughtered on the tusks of wild pigs. This game just can't compare with *Snack Attack II.*

I neglected to include the address for Emerging Technology with my November column. It is included this month. The company manufactures the *Edix* program editor and the *Wordix* text processor. I apologize for the omission.☐

Volkswriter Revisited

This column was prepared using the most current release of *Volkswriter* from Lifetree Software. Release 1.2 includes many important new features and has also been "smoothed" operationally.

Perhaps the most important improvement is the availability of a version of the program in which all functions are available in a single module. The delivered product is still two modules, but when the registration card is returned Lifetree will send the single module version. This program requires a 128K system, whereas the delivered program will run in 64K. The two-module version has been dramatically improved with the addition of a very simple feature: when transfer to the printing module is effected, the name of the file being edited by the editor module is transfered as well. That's really helpful.

Another important change is that the disk is no longer copy-protected. It is, thus, possible to back up the master disk, use the program from a hard disk, or use electronic disks. I really appreciate that, as I think most users will. It looks like Lifetree has decided that flexibility in the user's hands is more important than the limited protection a copy-protected disk provides.

After these, I liked the changes to the human interface best. Most notable is the ability to type ahead of the program. For example, I like to give the command to read in a file followed immediately by the command to edit it. However, the previous version of *Volkswriter* would not accept input until it was ready, and then anything typed ahead was discarded. Now type-ahead is accepted. The addition of this feature has not caused the excellent protection mechanisms *of Volkswriter* to be relaxed; the program discards type-ahead in these cases and waits for a definite answer to its query. And even if Ys and Ns are typed ahead, the program ignores them and waits for one subsequent to its prompt. This is a very good example of quality human engineering.

Major changes have been made in the way formats are handled. In the previous release of the program, formats created more work than they eliminated because it was constantly necessary to be sure *Volkswriter* was using the right one. Now formats can be associated with files in a simple way, and a master default format, different from the one *Volkswriter* uses, can also be defined.

Association of a format with a file is most easily accomplished by naming the format with the same filename and an extension of .FMT. It may also be made by naming the format VWFORMAT with an extension matching that of the file. Most important, a format, either a specifically associated format or a default format, is loaded whenever a file is retrieved from disk. This saves a lot of busywork, and is a wonderful improvement.

A number of new embedded commands have been added. The most significant are ..HEAD and ..FOOT which allows headers and footers to be added. These headers and footers can include an automatically generated page number, and a number of formatting options are available. There is a great similarity to the headers and footers of *EasyWriter,* but *Volkswriter* offers greater flexibility, especially because there can be more than three lines of header and footer.

One new feature was poorly done. It is another embedded command, ..VERB, which allows all characters to be passed through to a printer without *Volkswriter* interpretation. This is a valuable feature, but ..VERB works on a sectional basis, that is, on one or more lines of text at a time. The ability to pass arbitrary characters through to a printer should be implemented on a character-by-character basis.

Finally, a number of editor enhancements have been made which result in smoother operation. It is now possible to move to the beginning or end of a line with a single keystroke, an important improvement. Insertion mode is indicated by a different cursor appearance instead of by an indicator at the bottom of the screen. The line and column numbers are displayed in the status area. And the cursor now returns to its last position in the text after various operations: for example, the cursor position used to be lost after a tab setting operation was performed.

Volkswriter has reached adolesence, and it has done so quite rapidly. The program has become simpler to use as it has grown more powerful. It is easy to learn, even for a novice. If you are looking for an entry-level word processor, this program deserves serious consideration.

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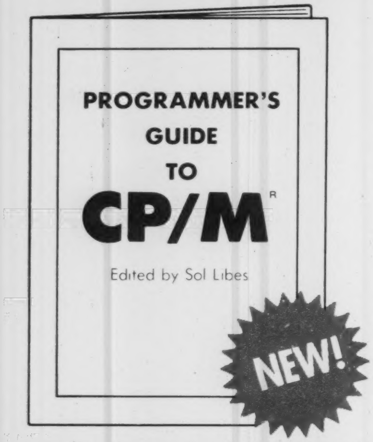
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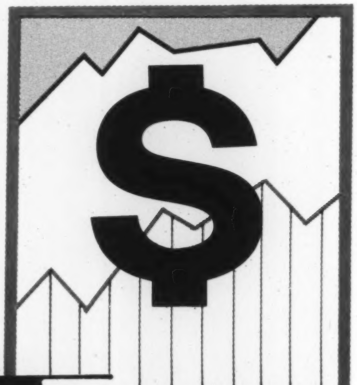

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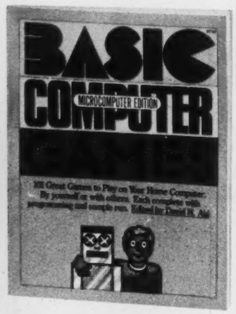
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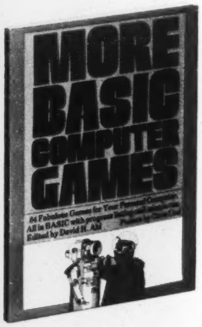
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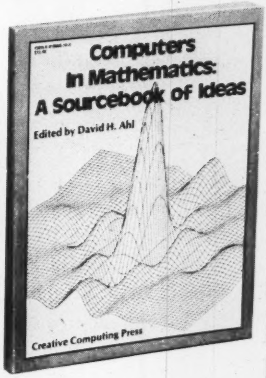
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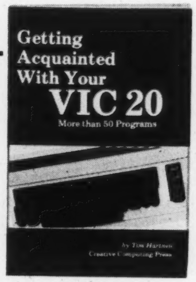
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Personal Electronic Transactions

Greg Yob

I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.

For the past five years I have faithfully pounded out my correspondence and articles on an ancient but trusty IBM Selectric I. My attitude toward word processing was summed up in these statements: "Who needs a word processor? Certainly not *me*! I write my copy once and out it goes; word processing is for the rewrite people." "If a word processor is like the editors I had to use at Tymshare several years ago, this is all for the birds. I'll look at WP when I can see what I am doing before I print it."

Well, the inevitable happened—one of my clients demanded his text in *WordPro* format so he could change the manuals with new releases of his products. I was persuaded to try word processing at last—and I am sold on it. The last few columns were done with *WordPro 4+* ($450 from Professional Software) on my 8032.

I am not going to bore you with a description of the features of *WordPro*. If you want to know these details, ask a Commodore dealer to give you a demonstration. Instead, here are a few words on how *WordPro* is affecting my writing and use of the Pet.

The first discovery is that WP lets me type more rapidly and more accurately. The Selectric is unforgiving of errors and each error forced me to stop and make the correction immediately. This broke the flow of my thoughts, so I tended to write less and in a choppier style. Next was the "perfectionist" phase where I had to get all of my output exactly correct, which took many printouts until I got used to reading the text on the screen. (Have you noticed that if it is on a CRT you don't read it?)

Then, my correspondence changed. I usually had to make a stack of letters by the typewriter to do in batches or, as happened most of the time, I hand scribbled notes in place of letters. Well, my handwriting is illegible even to me, so I have no idea how well I was understood by my correspondents. Now a simple letter template file makes letters more palatable—and *much* faster.

I am also using WP to maintain lists. For example, in the Vic products column (December 1982) I kept the alphabetical files and the product files on *WordPro*. This was forced on me after a catastrophe using *Jinsam* which wiped out quite a bit of work. The end result was better, for *WordPro* let me make the printout just as I liked it, which wasn't possible with *Jinsam*. (Be assured that *Jinsam* has its uses too.)

Then there is the elimination of copier use. Now my text is on disk, so I don't have to make copies for my correspondence files. In fact, the disks are far more compact than paper so I have now decided to make all of my written output via my 8032 and *WordPro*.

So, if you haven't already used a word processor, consider *WordPro*. I have found it worth its price—definitely.

More On The Best Vic Products

In the December column I took a very brief look at some 200 products for the Vic as a buyer's guide for Christmas. Unfortunately there wasn't enough space to say much about the best products individually. Here are some comments about the products that I liked the most.

Astroblitz******

Astroblitz (Creative Software, $46.95, cartridge) is my favorite game for the Vic. It is modeled after the Defender arcade game and kept me going for hours and hours. Don't give up if you get wiped out at the start (which you will). It took me about five hours of play to get past the first screen—but then things got better. If you ever get past 25,000 points there is a *nasty* surprise awaiting you!

Vic Forth******

The Vic can be found at some discount outlets for less than $180 which is indeed a bargain. A little known fact about the Vic is that it is more capable than the Aim-65 system (or the Kim or Sym for old timers) and costs less. If you are designing a dedicated computer to control equipment, take a hard look at the Vic.

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PET/VIC, continued...

ning language suited for process control and structured programming. The Forth cartridge from Human Engineered Software lets the Vic become an incredibly flexible machine for these things. HES has added many words to Fig-Forth to take advantage of such Vic features as sound and graphics. The cartridge sells for $59.95.

Though Forth is to some an eclectic language, this cartridge is one of the most seriously useful tools for the Vic.

Alphacom Printer *****

I have never liked the Vic printer—mainly due to its unusual paper size and slow speed. The Alphacom printer, which sells for $219, plugs into the Vic serial bus just like the Vic printer and, in most cases, behaves identically. (There is one minor difference which is described in the manual.)

The biggest plus for the Alphacom is its speed. It runs more than twice as fast as the Vic printer. The printer is thermal, so it is also much quieter. On the negative side, the printer is a 40-column device, and if you don't like thermal paper this isn't for you.

Oh yes, look at the price; it is quite a bit less than the Vic printer.

Defender On Tri *****

You control a somewhat fragile ship on a rescue mission which involves picking up several astronauts and threading a dangerous maze. A variety of ingenious hazards must be passed through, and you must keep track of your time and fuel supply. I could get through the first two screens and am working on a particularly tortuous passage in the third screen.

Defender on Tri requires both the usual hand-eye coordination and some strategy as well. Note: you do need at least 3K more of memory for this game. The game is from Nufenkop and sells for $12.95 on tape.

Chomper, Snakman and Trashman *****

Chomper from Random Access Computers and *Snakman* from Microdigital are very close imitations of our familiar all-devouring yellow dot (I wonder if Pac-Man is the reincarnation of the Happy Face of the 70's). I very slightly prefer *Chomper,* but I haven't spent enough quarters to know the real thing that well. Both games are sold on tape. *Chomper* is $12.95, and *Snakman* is $24.95.

Trashman from Creative Software is the same thing with a different cast of characters, in this case a garbage truck which you drive and giant flies (inspired, no doubt, by the famous Medfly here in Silicon Gulch) which chase you. *Trashman* lets you set the bonus level so as you improve in skill you can make the game harder. It sells for $46.95 in cartridge form.

Hopper *****

Hopper from Data Equipment Supply is like the arcade game Frogger. You use the joystick to help a froggie across a road, through some buildings and moving walls, to one of several safe spots. Then it starts all over again with fewer safe spots. I had a lot of fun with this one, and the jumping sound is the best sound I've heard from the Vic. The tape sells for $12.

VIE Vic to IEEE-488 *****

If you own other Commodore equipment or have a lab with IEEE-488 equipment, this cartridge can provide the IEEE-488 bus interface for a Vic. For example, I used this cartridge with my standard CBM 4040 or 8050 drives and saved the expense of buying the Vic disk drive unit.

Just plug in the cartridge and do a SYS and the Vic speaks IEEE-488 for devices 4 to 31. The Vic and this cartridge provide the least expensive IEEE-488 controller for a lab that I know of—less than $300 total. (Note: Micro-Sytems, the manufacturer, tells me that they have a similar unit for the Pet-64. As far as I know, Commodore has never released their IEEE-488 cartridge, so get this one for $79.95 instead.)

PromQueen *****

The PromQueen cartridge from Gloucester Computer Bus is designed for two major functions. First, it can program 2716 and 2732 EPROMs which is very handy if you are developing firmware for the Vic. A "shadow" memory is provided so you can first load the code into the same address as the ROM for testing. A ROM is provided with a program for hexadecimal editing of the ROM pattern and the burning routine. This relocates to leave the memory space free for the blank ROM.

Second, you can use a jumper cable to attach the ROM socket to a RAM socket in some other machine. The shadow memory permits the other machine to see memory and switching back and forth, you can more rapidly work with other dedicated machines (this is called a development system in some circles). The cartridge sells for $174.50.

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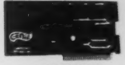

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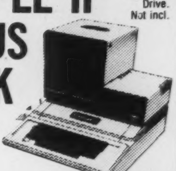

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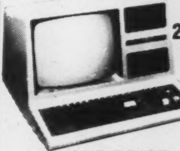

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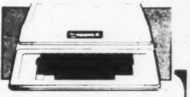

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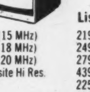

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A new ROM is now available with more functions for the advanced user.

Terminal 40 ***

Of the several dumb terminal programs for the Vic, *Terminal 40* from Midwest Micro Associates is by far the best. It assumes that you have an RS-232 device on the User Port. (This can be the VicModem or an RS-232 adapter and a standard modem.) By working magic with the programmable characters, the device makes 40 columns appear on the screen with readable characters.

Another nice feature is smooth scrolling of the lines, which is a big and fancy feature of terminals like the VT-100.

To my surprise, most dumb terminal programs for the Vic do not handle control characters. *Terminal 40* handles these with ease using the CTRL key just as you would expect. I found *Terminal 40* a much better program than the one supplied with the VicModem.

Public Domain for Vic ***

Public Domain has taken on the unenviable task of collecting all known public software for the Pet and Vic. They are planning to provide these programs at $10 per disk filled with programs on an "as-is" basis. They also plan to offer selected collections of the best programs as well.

Their first collection includes 80 programs taken from several Vic user groups. Since many Vic owners do not have disks, both disks and tapes will be available. This is an incredible bargain, and if you are learning about your Vic, these programs will teach you many interesting things.

HesWriter ***

The problem with most of the Vic word processors (aside from the 22-column screen which is unavoidable) is that they either require additional memory just to hold the word processing program or are very limited. *HesWriter* from Human Engineered Software has most of the desirable word processing features, and I consider it to be the best word processor for the Vic at present. It sells for $39.95.

(I must admit to some bias about word processors. I avoided using one on my 40-column Pet mostly due to the inability to see on the screen what the processor would give as output. If you are serious about WP, get a computer with an 80- or 132-column display first.)

BUTI Basic Utility ***

BUTI from United Microware Industries is a ROM chip with some firmware equivalent to the *Programmer's Toolkit* with commands like Auto, Renumber, Trace, and so on. Several additional commands to help with the Vic are included. The retail price is $34.95.

UMI should have put BUTI into a cartridge. Currently you have to buy a cartridge with empty ROM sockets (another $30 or so from UMI) in order to install it.

Vic Carrying Case ***

If you travel a lot with your Vic, this nifty and well built carrying case from Carry-Comp will hold your treasure well. Space is provided for the Vic, power supply, tape deck, and a few tapes and manuals. Everything is protected with a plush furry fabric. It sells for $89.95. Carry-Comp will also have a larger case with space for the disk and printer.

Bike Exercise **

The *Softpedal Bike Exerciser* from Practical Applications is perhaps the most unusual Vic product I have seen. It includes a stand for a standard bicycle which supports it for stationary cycling and has some fans to provide the biker with a drag to work against.

A sensor, which plugs into the Vic User Port, is attached to the rear wheel. The software times the turning rate of the wheel and calculates your speed and mileage. Two programs are provided, one for exercise work and one for simulating bike racing.

I found the software, which costs $145, a bit crude and expect that Practical Applications will provide better programs soon.

RS-232 Interface **

The Printer RS-232 interface from United Microware Industries is the best of the RS-232 interfaces in construction and clarity of instructions. The Commodore RS-232 interface is a close second. I found the required diagrams for using the Vic RS-232 port quite clear. A short dumb terminal program is included to get you started. The interface is priced at $49.95.

Expansion Board **

The Expandor 3-slot expansion board from Precision Technology is my favorite of the six expansion boards I tried for the Vic. Though some units had protective plastic covers and others had lots of options (for more money), this unit merely has a selection switch for each slot which lets you keep several cartridges plugged in. The switch tells the Vic which one to see.

The cheaper units did not have this feature, so in many uses they could serve only to save some wear and tear on the main connector. I do find that an expansion unit is easier to plug and unplug than the Vic connector. The Precision Technology board sells for $59.95.

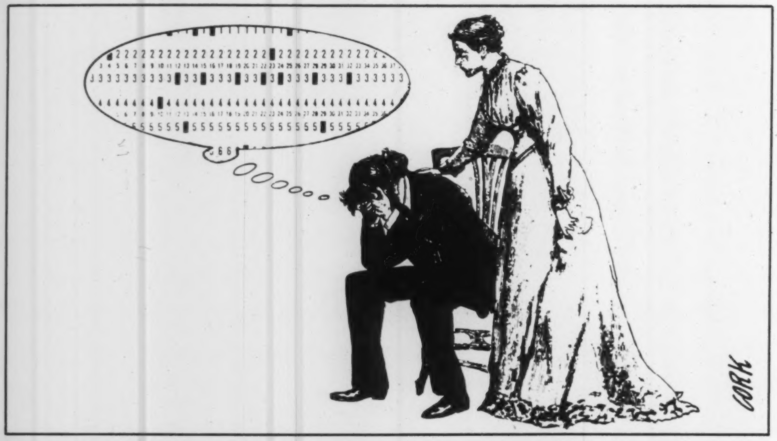
Turtle Graphics **

The turtle is a popular educational tool for graphics. The *Turtle Graphics* cartridge from Human Engineered Software provides a turtle language for the Vic. You can make fairly complex graphics and sound effects with Turtle without the gyrations required in Basic.

Be aware that this is not the Logo turtle, which is a more sophisticated tool for education. The HES Turtle is fun to use once you realize this. The cartridge sells for $39.95.

Typing Tutor **

Typing Tutor from Academy Software is a series of lessons in the use of the keyboard. It includes all of the patterned drills needed to help with typing ability.



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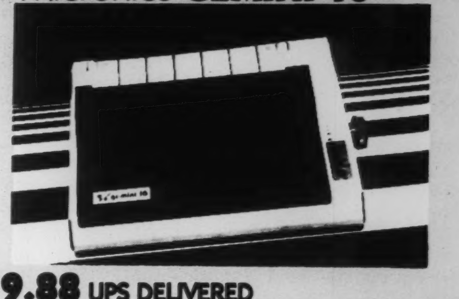

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PET/VIC, continued...

Several kinds of exercises help relieve the tedium of this kind of work. I remember with dismay the times that I learned typing the old way (my Selectric finally taught me typing), and the Vic is far better. The tape sells for $9.95.

A Bit of Twiddling For 8032 Owners

Though the focus of this column has been on the Vic, the 40-column Pet and recently the '64, there is an important minority group in the Pet world—the owners of the 8032 80-column machines. Here is some fun just for you guys.

Buried in the 8032 is a chip, the Motorola MC6845, which controls the 8032 display screen. This chip deals with items like the number of characters on the screen, where the video RAM is to be seen on the display and sundry similar things. To the 8032 this chip appears at two addresses, the pointer register at 59520 and the video register at 59521. The pointer register (PR) is used to select which one of the 17 internal registers of the MC6845 is to appear at the address of the video register (VR). For example, a POKE 59520,5 would select the fifth CRT register (CR) to be seen at the location 59521. A POKE 59521,13 would set CR #5 to the value 13.

The gory details on these CRs can be found in *Programming The PET/CBM* by Raeto West on pages 270-271. I highly recommend this book.

If you want to play with the 17 registers, the program in Listing 1, the 8032 CRT Explorer, may be used. It asks for the register number (the number of the CR), draws a test pattern, and asks for the value to be put into the register. Enter a -1 to get back to the register number question. Note subroutine 1000 which restores the original 8032 values to all of the registers.

There is one caution with this program: some values of the registers will either cause the display to freeze up (with or without visible garbage) or worse, the electronics in the CRT will complain audibly. I got several ominous crackling sounds and high pitched screams while fiddling about. I suggest that you save the program on disk and keep a reset button handy. Don't leave your 8032 in a state of display stress—damage may result.

For just fun, the program in Listing 2 goes through most of the interesting video states available from the controller. Don't try extending the ranges given in the program without first seeing what the program will do. When using numbers outside of these ranges, I found they were dull or that my CRT was telling me that it didn't like being tortured that way. ☐

Listing 1. 8032 CRT Explorer.

```
10 REM 8032 CRT CONTROLLER EXPLORER
20 PR=59520:CR=PR+1
30 INPUT"REGISTER NUMBER:";RG
40 IF RG<0 OR RG>17 THEN 30
50 POKE PR,RG:GOSUB2000:PRINT"REGISTER NUMBER:"RG"   "
60 INPUT"REGISTER  VALUE:";RV
70 IF RV<0 THEN GOSUB1000:GOTO 30
80 IF RV>255 THEN 60
90 POKE CR,RV:GOTO60
1000 REM RESTORE TO ORIGINAL VALUES
1010 RESTORE:FORRG=0TO17:READRV:POKEPR,RG:POKECR,RV:NEXT:RETURN
1020 DATA 49,40,41,15,39,0,25,32,0,9,0,0,16,0,0,0,0,0
2000 REM TEST PATTERN
2010 PRINT"":PRINT:FORL=1TO20:FORM=0TO9
2020 PRINTCHR$(64+M)"       ";:NEXT:NEXT:RETURN
```

Note: Several lines use the CBM screen control characters.
In particular:

Line 30 has a CLEAR before the text.
Line 50 has HOME before the text.
Line 60 has HOME CRSR DOWN before the text.
Line 2010 has a CLEAR in the first PRINT statement.

Listing 2. 8032 CRT Demo.

```
10 REM 8032 CRT CONTROLLER DEMO
20 PR=59520:CR=PR+1
30 GOSUB 2000
40 RG=0:RV=41:GOSUB3000:FORJ=1TO4500:NEXTJ
50 LO=42:HI=52:DL=500:GOSUB4000
60 RG=1:LO=0:HI=50:DL=300:GOSUB4000
70 RG=2:LO=0:HI=48:DL=200:GOSUB4000
80 RG=3:LO=0:HI=128:DL=200:GOSUB4000
90 RG=4:LO=28:HI=127:DL=200:GOSUB4000
100 RG=5:LO=0:HI=63:DL=100:GOSUB4000
110 RG=6:LO=0:HI=27:DL=200:GOSUB4000
120 RV=34:GOSUB3000:GOSUB1000
130 RG=7:LO=0:HI=33:DL=200:GOSUB4000
140 RG=8:LO=0:HI=31:DL=200:GOSUB4000
150 RG=9:LO=0:HI=31:DL=200:GOSUB4000
160 RG=13:LO=0:HI=255:DL=100:GOSUB4000
170 RG=12:LO=0:HI=127:DL=200:GOSUB4000
180 PRINT"AND THAT'S ALL, FOLKS....."
190 END

1000 REM RESTORE TO ORIGINAL VALUES
1010 RESTORE:FORRG=0TO17:READRV:POKEPR,RG:POKECR,RV:NEXT:RETURN
1020 DATA 49,40,41,15,39,0,25,32,0,9,0,0,16,0,0,0,0,0
2000 REM TEST PATTERN
2010 PRINT"":PRINT:FORL=1TO22:FORM=0TO9
2020 PRINTCHR$(64+M)"       ";:NEXT:NEXT:RETURN
3000 REM POKE INTO REGISTERS AND GIVE SHORT DELAY
3010 POKE PR,RG:POKE CR,RV
3020 FORJ=1TODL:NEXTJ:RETURN
4000 REM GO THRU RANGE LO TO HI
4010 FOR RV=LO TO HI:GOSUB 3000:NEXT:GOSUB1000
4020 FORJ=1TO2000:NEXT:RETURN
```

Note: Line 2010 has a CLEAR between the quotes in the PRINT.

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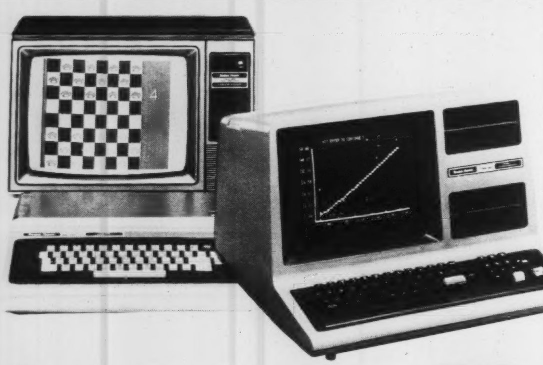

rings...trs-80 strings...trs-8

Stephen B. Gray

Pausing just before the 48th twirl around the ice rink between the Tandy Towers in Fort Worth, we look at the PT-210 Portable Data Terminal, how to write a secret program that can't be revealed by a `LIST`ing, how Radio Shack stores uses the TRS-80 for reporting to headquarters, packing strings with *Debug*, a few words about Color Computer manuals, and a short program that displays asterisks no matter what you type.

New Product Preview

Last September, New York's St. Regis Hotel was the scene of the annual Tandy Corp./Radio Shack New Product Preview. This preview included a roomful of new products that appear in the 1983 Radio Shack general merchandise and computer products catalogs, displayed for examination by security analysts and the press.

In addition to new stereo equipment, modular telephones, auto anti-theft alarms and such, the display included high-resolution graphics for the TRS-80 Model I and III, several new printers, Winchester hard-disk drives, the Portable Data Terminal, and several software products. An adjoining room offered the opportunity to play a variety of Color Computer games, to try out Logo or watch it in operation, and to examine a prototype videodisc/computer system.

Portable Data Terminal

The PT-210 Portable Data Terminal, priced at $995, is Radio Shack's first venture into the portable printing terminal market. It includes a full QWERTY keyboard, a very quiet 80-column dot-matrix thermal printer, and an acoustic telephone coupler.

The terminal, as a Radio Shack executive put it, is "an approach to the Teletype market as a low-cost alternative to what's available. Radio Shack stores are everywhere, so it's easy to get the terminal fixed when necessary."

You can use the PT-210 at your office to communicate with your TRS-80 at home, if your computer is turned on, and is equipped with communications software and an auto-answer modem such as the Modem II. The terminal can be used for timesharing, and by at-home programmers.

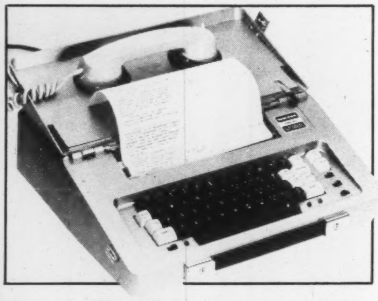

Figure 1. The PT-210 Portable Data Terminal weighs 15 pounds, prints quietly, and communicates with almost any modem-equipped computer.

Using the PT-210, you can communicate over a telephone line with just about any computer equipped with a modem, from a TRS-80 to a mainframe. Add the $69.95 RS-232C interface and you don't need the telephone coupler any more; just wire the terminal to a direct-connect modem such as Radio Shack's $149 Modem I or $249 Modem II.

At the preview, the PT-210 was connected to a mainframe computer in California, via a data-formatting accessory.

Videodisc and Computer

One of the most fascinating preview displays was a prototype combination of a videodisc player and a TRS-80 Model III computer, engineered at the University of Nebraska and envisioned for the industrial training market. A special circuit board mounted in the Model III permits the computer CRT to show pictures from the videodisc player. Thus the screen can display either television pictures or computer characters.

Although the prototype was programmed to run by itself, to demonstrate continuously the basic principles by switching back and forth from TV pictures to computer displays, it could have been programmed for interactive use. For example, a picture of a relay, with its contacts labelled, could be shown from the videodisc, and the computer could then ask a multiple-choice question on how to wire the relay for a particular purpose. Then, depending on the response, the computer could call up videodisc frames to either tell the user he was right, or show him exactly why he was wrong.

But don't count on the videodisc/computer combination becoming a product; it's still in prototype for evaluation.

Covering Up Program Lines

Dennis Tanner, Radio Shack's Manager of Educational Products Development, demonstrated Logo for me. He also showed me how to cover up program lines with meaningless words, so

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that a secret program can be concealed. First you write a program line, such as

```
10 PRINT ''HELLO''
```

and after you ENTER it, you call it up with

```
EDIT 10
```

and then hit X to move the cursor to the end of the line. Hit SHIFT 7 to write a single quote (also called apostrophe), which is the abbreviation for REM.

Now comes the basic secret. While holding down the shift key, press the left-arrow key, which backs up the cursor—without erasing any characters—until it gets to the beginning of the line. Then you can enter any phase or group of characters you wish, such as

```
NOW IS THE TIME
```

by writing it over the old line, followed by hitting the ENTER key.

If you do a RUN, you don't get

```
SYNTAX ERROR IN 10
```

as might be expected, but rather

```
HELLO
```

which is what the original line called for. If you LIST line 10, the part before the apostrophe will show on the screen, but so briefly you won't be able to read it. However, if you do an

```
EDIT 10
```

and use the spacebar to look at the line letter by letter, you'll see the cursor move to the right as it traces the original line, then move left to the beginning of the line and, moving right once more, trace the cover-up words. What you have created, of course, is a line that includes a REM statement that includes several backspaces. When you LIST it, the line folds over and conceals the characters you placed to the left of the apostrophe.

You can use

```
:REM
```

instead of the apostrophe, but that takes more space and time. When backspacing the cursor, the SHIFT key must be held down while the back-arrow key is being operated, otherwise the line will be erased. And you can't simply write a line, add an apostrophe, and back up the cursor with the SHIFT/left-arrow combination; this will erase the line. You must write the line first, and then go into edit mode.

Note that you can cover the original program entirely with text, or you can use the original line numbers and make the program look entirely different, using a cover-up program that would work, or one that wouldn't. All sorts of fiendish things can be done with this idea, such as altering just one line in a friend's program.

Model III For Store Inventory

While at the Radio Shack preview, I spoke with Jon Shirley, vice president of Radio Shack Computer Merchandising, and author of the "View From the Seventh Floor" column in the "TRS-80 Microcomputer News."

He told me that all 4400 Radio Shack stores in the continental U.S. and Puerto Rico use TRS-80 Model IIIs every night to call orders in to headquarters in Fort Worth, and to transmit daily reports and payroll information. The Computer Centers are on the same system, each using a Model II. The information is processed in Fort Worth by a Tandem "NonStop" computer system, which uses a pair of processors arranged so that one will continue to operate if the other should fail.

Orders can be transmitted faster to warehouses now, eliminating several costs, as well as keypunch errors, and improving inventory turnover. Program updates can be quickly sent to stores, as well as inventory information. An electronic-mail system will eventually be installed for transmitting individual messages to stores.

Radio Shack will change, and perhaps by now already has, to an auto-dial system with automatic polling, so nobody has to be at the stores to transmit data to Fort Worth, as long as the Model III or II is left on.

Shirley has a Model II in his office, as do many other people in Fort Worth management. Radio Shack is working toward networking these machines via Datapoint's ARCnet.

String Packing Using Debug

Back in the December 1980 column (p. 194), we discussed how to create graphics using string packing, which was invented by Leo Christopherson, the ace graphics artist and game programmer who was signed up by Radio Shack last year (Dec. 1982, p. 408).

Leo's string packing assigns characters in the string. Then you look into memory, with the variable pointer VARPTR, to find out where the computer stored the string, and you just POKE the graphics codes into the string.

Dennis Tanner is quite a programmer himself, having been a Radio Shack programmer for a year after leaving teaching, and before moving into the Educational Division. He invented a new way to pack strings, using *Debug* in Model III TRSDOS, which eliminates the use of VARPTR, because it is not modifying the program in memory, but modifying the program on disk. Dennis says he taught this method to Leo Christopherson, and that it was due to appear in Radio Shack's "TRS-80 Microcomputer News," where you may have seen it by now.

First you write a program in Basic, such as

```
10 A$="    "
20 PRINT A$
30 PRINT LEN (A$)
```

then save it with

```
SAVE ''DENNIS'', A
```

which puts it in ASCII format.

Return to TRSDOS by using

```
CMD''S''
```

(you can leave out the second pair of quotes) and then type

```
DEBUG
```

followed by

```
F
```

which calls up the File Patch utility that allows you to modify the contents of a diskette file, and which will cause the *Debug* program to respond with the prompt

```
FILESPEC?
```

So you enter the name of the file to be patched

```
DENNIS
```

and *Debug* sets up a full-screen display that shows the first 256 bytes in the DENNIS file. The top line will display at left, in part, 3130 2041 243D 2220 2020 2022 and display at top right the ASCII equivalent

```
10 A$="    "
```

The 20 is a space, in hex code, and there are four of them, one for each blank space between the quotes in line 10.

Next you press

```
M
```

to get into Modify-Memory mode. Now you can pack the string with whatever you like, by simply writing new hex values over the old. Use four

```
BF
```

for instance, and then

```
ENTER
```

to keep all the changes made (by updating the diskette file) and to get out of the Modify-Memory mode. Press the BREAK key twice to return to TRSDOS. To see the effect of packing the string with BFBF, do a

```
RUN ''DENNIS''
```

and the display will show

```
█
4
```

instead of only the 4 that was displayed when the original program was run. BF is the hex-code equivalent of decimal 191, which is the graphics character consisting of all six blocks. Note that you could also have changed the line numbers, to 100-110-120, or whatever you wish.

That's how easy it is, with string-packing using *Debug* on a TRS-80 Model III. One big advantage of using *Debug* is that, as you write new hex values into the blank spaces between the quote marks, you can immediately see what the equivalent graphics characters will look like, over at the right side of the

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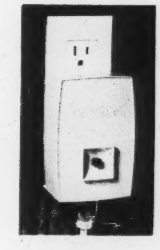

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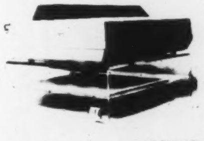

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TRS-80 Strings, continued...

screen, where the ASCII translation is shown. Just remember that you have to store the original program in ASCII format.

Color Upgrades Cost Less

Now that the 16K Color Computer is available for $399.95, or 95 cents more than the 4K Color Computer previously was, the cost of upgrading your 4K Color Computer to 16K has been reduced from $99 to $49. The Extended Color Basic ROM Kit (which requires a minimum of 16K) is still the same $99, but both the added memory and the Extended Basic can be installed for a $30 labor charge.

If you are into color graphics, the additional features are well worth the money. You get high-resolution graphics (up to 256 by 192 pixels); automated drawing of lines, rectangles and circles; a DRAW mode for simplified sketching; as well as additional functions such as SQR, EXP, LOG and more.

One of the few problems is the manual. The 4K manual, "Getting Started with Color Basic," seems to have been written for children, which may be better than if Radio Shack had tried to write it for adults, because anybody ten or older can understand this manual. Except for most of the section on string operators, that is. And the manual makes no mention at all of about 20 functions, such as LIST, ABS, and SIN.

As elementary and as frustrating as the 4K manual is, it's better than the "Going Ahead with Extended Color Basic" manual. In some places the Extended manual just barely mentions a feature, and in others makes another feature sound highly complicated.

For example, the manual is too complex when trying to explain why you are limited to displaying two colors in some circumstances, or why you need to reserve pages, or why PCLEAR or PCOPY is needed. On the other hand, the manual keeps mentioning all sorts of goodies, but doesn't give much detail beyond one simple illustration each. Several programs cry out for an explanation, but none is given for most of them. There is great power in Extended Basic graphics, but the Radio Shack manual only begins to hint at it.

Non-Radio Shack Color Books

As noted before, Radio Shack's delinquency in generating decent manuals for all too many TRS-80 products provides work and profit for freelance writers. Just look at page 41 of the RSC-8 catalog, which has at least half a dozen books written by outsiders—books of the caliber the Radio Shack manuals should be.

Listing 1.

```
10 CLS
20 I$=INKEY$: IF I$="" THEN 20
30 IF I$=CHR$(8) AND A$<>"" THEN PRINT CHR$(8);:
   A$=LEFT$(A$,LEN(A$)-1): GOTO 20
50 IF I$=CHR$(13) PRINT A$: END
60 IF ASC(I$)<32 OR ASC(I$)>127 THEN 20
70 A$=A$+I$
80 PRINT "*";: GOTO 20
90 GOTO 20
```

A very good book published recently by John Wiley & Sons is "TRS-80 Color Basic," by Bob Albrecht. However, it doesn't get into Extended Color Basic, because the author knew his friend Don Inman was writing a book on the subject, which Reston published and which will be reviewed here. Meanwhile, the Albrecht book is highly recommended for its fine, extensive coverage of Color Basic; look for it in the Book Review section of a future issue.

Short Program #36

Sometimes you don't want to display certain numbers or letters when you use the keyboard. For example, when you are logging on to a timesharing system, it will usually ask for your password. You don't want somebody standing near your terminal to see your password and perhaps use it later, so the system usually doesn't print it. Or if you use a sidewalk banking terminal (known as an ATM, or "automatic teller machine," in the trade), you don't want people in line behind you to see your " personal security number" as you key it in. So the terminal may display asterisks instead of your number.

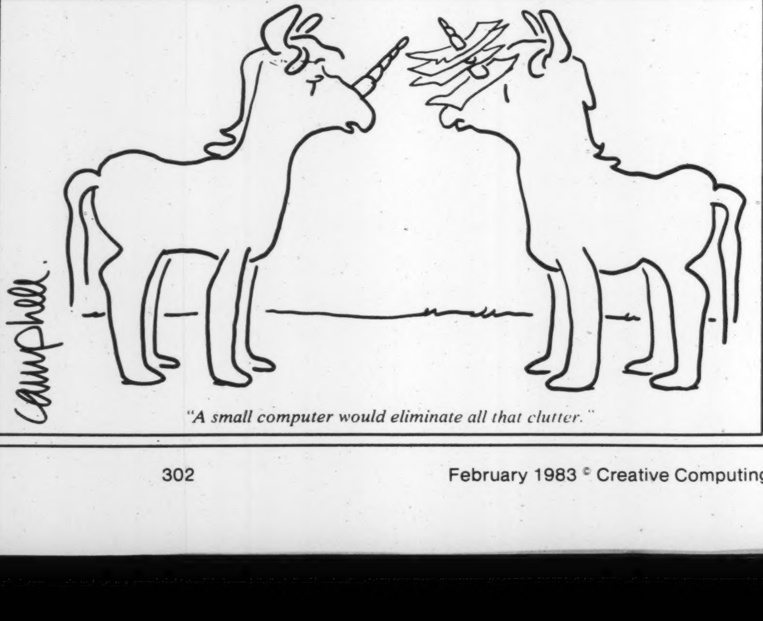
How can you make your TRS-80 do the same thing? Dennis Tanner had written the "cover-up" program so quickly, I asked if he could write another that would print asterisks instead of whatever is being entered from the keyboard. Within a few minutes he wrote a program that worked perfectly, and which would have takenme much longer to write. It appears in Listing1 with only a smidgen deleted to simplify it.

The use of INKEY$ in line 20 lets you build a string of characters in line 70. These characters are limited, by line 60, to those whose ASCII values are between 32 and 127, but line 80 prints an asterisk for each key you press. When you hit the ENTER key, line 50 senses the carriage return (ASCII code 13), and prints the string of characters right after the row of asterisks that represents those character.

What does line 30 do? It lets you backspace to correct any mistakes you may make in entering your secret number. ASCII code 8 "backspaces and erases current character," according to the Level-II manual. Can you figure out how the LEFT$ and LEN string operators work here?

You can change line 80 to display any character you wish in place of the asterisk. By changing the numbers in line 60, you can restrict the "secret number" to letters only, or numbers only, etc. You can turn this short program into a subroutine, perhaps as part of an ATM program for a banking simulation, and use the secret number within the program without ever displaying it.

Why can't line 30 be split in two? Rewrite it in two parts, using lines 30 and 40, and try to figure out what happens when you try to RUN this new version. ☐



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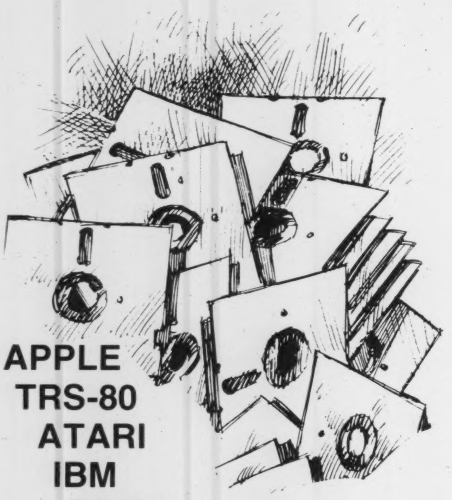

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Steve Gray, et al.

The VisiCalc Book (Apple Edition) by Donald H. Beil, Reston Publishing Co., Reston, VA. 301 pages. $14.95. 1982. (Atari and IBM PC versions to follow.)

When this book arrived in the mail, my first inclination was to scream, shout, and throw a temper tantrum. So I did.

I wanted to write such a tome myself last year, and even talked to a publisher about it. Alas, nothing has come of my idea to date.

Donald Beil's book isn't what I was and am thinking of, I'm pleased to say, but it appears to be an awfully good tutorial for the many people who use this popular program.

It is clear, well-illustrated, and well-indexed, with a bibliography. As such, it should prove useful to beginners as well as experienced VisiCalc users as well.

Beil is an associate professor at the National Technical Institute for the Deaf at the Rochester (NY) Institute of Technology. He has obviously tried to think as a user would, rather than as a scholar. For example, he emphasizes making backups of everything you do, including having trained people who can use the system if the usual person isn't available.

Chapter 8 is titled Recognizing, Preventing, and Correcting Errors. In it, Beil shows some common errors, with examples. He talks about how data entry activity on the spreadsheet is the most common source of errors. He explains some simple checks that can be used to detect errors.

Much of the book is devoted to the idea of templates. That is, using a preformatted design that may be upgraded for each period the operator desires. This could include such things as a daily production report, a weekly test results printout, a monthly sales report, a quarterly marketing review, or a yearly report. Each of these need be designed onto VisiCalc templates only once, then upgraded as necessary.

As an example, let's set one up for weekly salaries of the staff. It might allow data entry for only the hours worked. Through careful planning, it would deduct the correct amount of taxes, social security, insurance, etc., automatically and provide a listing of what each employee should be paid. This template could be saved as "Weekly Salary."

Every Friday, when it is time to write the paychecks, the checkwriter simply loads "Weekly Salary" into memory, types in the hours worked from time cards or whatever, presses the manual calculation ! key, and prints out the report from which the checks will be written. Then he can SAVE the updated report to disk as "Weekly Salary Wk. 23" or whatever is appropriate.

The following week, once again "Weekly Salary" is plugged in and used. It can easily be changed and updated as personnel come and go, and taxes and other expenses change. Beil shows how such documents can be laid out in such a way as to minimize data entry errors. He even lists 21 template guidelines that should prove invaluable to anyone who wants to use this easy way out.

Another chapter is on Documentation. He illustrates how easy—and wise—it is to provide internal documentation on the spreadsheet itself.

One shortcoming of the book is its lack of support sources. That is, it doesn't talk about such items as VersaCalc, or any of the other programs that will support it. It simply notes that such things are available. It also passes over the Data Interchange Format (DIF) with just two brief mentions. This needs much more exploration.

Beil's book appears well worth the money, however, for anyone who is using VisiCalc. As for me, I'm going to go out and look for a publisher for my VisiCalc book.

—Dale Archibald

TRS-80 Model III: Programming and Applications, by Larry Joel Goldstein. Robert J. Brady Co., A Prentice-Hall Co., Bowie, MD 20715. 315 pages, paperback $12.95. 1982.

The back cover says this is "for the first time ever," a text specifically designed for novices and experienced users of the TRS-80 Model III, offering a "thorough yet refreshingly informed introduction to programming in Basic."

Well, if there were no author's name on the book, you might think it was written by Bob Albrecht and/or Don Inman. There is the same boldface for program lines, the same informal writing, even the same enclosing of some call-out phrases in wavy clouds, just like the dragonmasters of Menlo Park (that's an inside joke, son).

Which is not to detract from this book; after all, Albrecht and Inman have written some of the best and easiest to read computer texts available. This one has all the usual chapters a good Basic book has, plus one with a title seldom seen in such a book: word processing. However, that chapter is mostly about string manipulation and printer operation. *Scripsit* is mentioned in passing, and a brief word-processing program is presented.

The chapter on Programming for Scientists also has a somewhat misleading title: it is about double-precision numbers, variable types, mathematical functions, and USR. A nice touch is the last chapter, on Where To Go From Here, which suggests assembly-language programming, other languages (Fortran, Cobol, Pascal) and operating languages (CP/M).

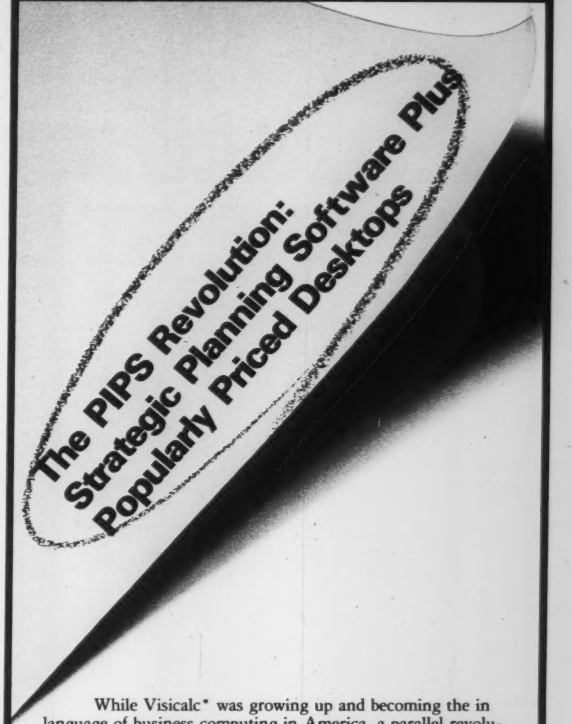
Exercises are presented after each section, and answers to "selected" ones (actually, most of them) are in the back of the book.

This is one of the best books on TRS-80 Model III Basic available, with very clear writing, a no-nonsense and keep-it-moving approach (he's up to print zones by page 19), many program examples set off in boldface, and much detail. Also, this is one of the handsomest books available on computer programming.

CAI Sourcebook, by Robert L. Burke. Prentice-Hall Inc., Englewood Cliffs, NJ. 219 pages, hardcover $14.95. 1982.

The front of the dust jacket carries a subtitle of sorts, "Background and Procedures for Computer Assisted Instruction in Education and Industrial Training," while the back says "this book provides a step-by-step introduction to the systematic development and validation of CAI courseware," and also says the book shows how to develop CAI courseware for microcomputers.

The dozen chapters involve: Becoming a Computer Assisted Instruction Author, What is CAI?, Microcomputers and CAI, Systems Thinking and CAI, Instructional Writing and CAI, CAI Frame Protocols (with over 20 samples), CAI



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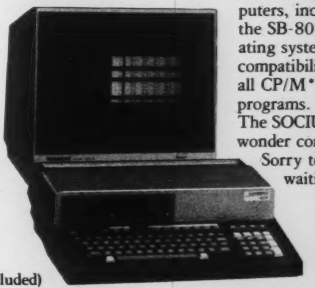

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Lesson Designs, Validation of CAI Lessons, Developing the CAI Lesson, CAI Courseware Review, Cashing In (getting started, publishing and distributing courseware, etc.), and The Future of Microcomputer CAI. The book ends with a 24-page glossary that is concise and relaxed; a prompt is described as "Any technique which is built into the lesson to help the student make the correct response."

The text itself is concise and relaxed, and breaks the verbiage into subheaded groups of several short paragraphs each, to make for easy reading, which is helpful because the entire text is typed. Yet the chapter names are set in MICR capital letters, sometimes difficult to read.

Anyway, the author does provide a great deal of material on developing CAI lessons, with many examples, and even includes advice on how to publish your own courseware. If you use microcomputers in teaching, or write CAI lessons, or want to get into CAI, you are bound to find useful material in this detailed book.

VisiCalc Home and Office Companion, by David M. Castlewitz and Lawrence J. Chisausky with Patricia Kronberg. Osborne/McGraw-Hill, Berkeley, CA. 186 pages, paperback $15.99. 1982.

The "companion" consists of 50 VisiCalc models, each offering a short description, sample printed reports, and a listing. Five of the seven categories are for business: Loans and Investments (bond portfolio, promissory notes, rental property), General Business (break-even point, cash-flow analysis, financial schedules), Inventory Control (EOQ, value of inventory, in-stock position), Advertising and Sales (retail mark-up, seasonal index, survey results, etc.), and Personnel and Departments (mini-payroll worksheet, time sheet, client survey, etc.).

Two categories provide personal models: Personal Finance (home inventory and personal-possessions evaluation, net worth statement, collector's values), and Household Aids (events scheduling, vacation tour planner, paint a room). All 50 models are "designed to accommodate most computers and all versions of the VisiCalc program," the back cover says.

As usual with nearly all Osborne/McGraw-Hill books, this one is very handsomely produced, with neat layouts, easily readable reports, and very careful attention to detail. One slight problem: some of the program listings are a little faint, but can be read if you peer closely enough. The book is enlivened with occasional semi-cartoon drawings that help relieve what would otherwise be a bookful of type and printouts; they are among the best illustrations to be found in any computer-related book, and are by L.D. Chukman.

Once more, Osborne/McGraw-Hill has generated a fine book, and although very few readers will find a use for all 50 programs, anybody who has VisiCalc should take a good look at this "companion."

The Custom TRS-80 & Other Mysteries, by Dennis Bathory Kitsz. IJG Inc., 1260 West Foothill Blvd., Upland, CA 91786. 335 pages, paperback $29.95. 1982.

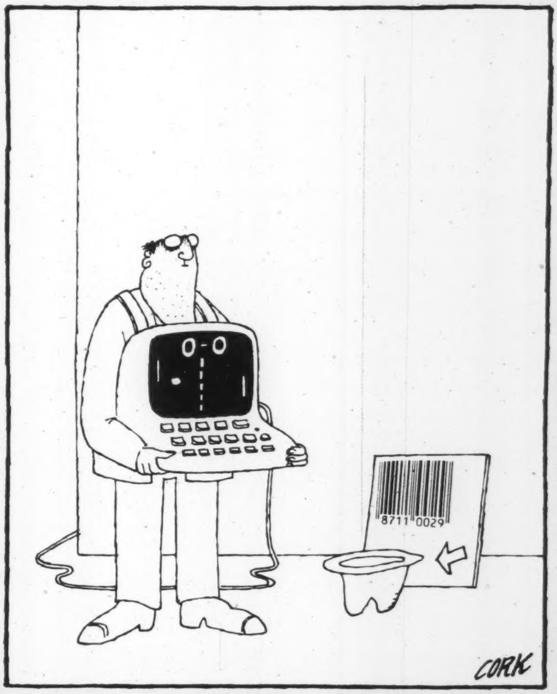
In their three previous "Mysteries" books, IJG revealed as much as possible about what goes on inside the TRS-80 and how to get the most out of it. This fourth Mysteries book involves actually getting inside the Model I TRS-80 and modifying it in various ways, and is not for the butterfingered or faint of heart. Page 2 warns that modifying a TRS-80 will void the warranty, and that "modifications are done at your own risk."

If you get past the warning, pages 8 and 9 list the tools you will need, from a screwdriver to a drill. If you feel comfortable using such tools on your TRS-80, go on to the first chapter, which is all about Getting Inside, written very simply at first, but by page 25 getting into masking out the interrupt, with an explanation that is simple enough for bright readers; this is the beginning of power-up routines in assembler, some knowledge of which certainly wouldn't hurt here.

Subsequent chapters (which have no names) get into areas such as number systems, wire-wrapping techniques, software mods (keyboard debounce, machine language monitor, etc.), simple mods (adding 16K memory, adding an extra keyboard, reverse video), adding a HALT instruction, fixing relays, adding hi-res graphics, interfacing the TRS-80 for making music and control, adding a printer interface, adding an 8-track mass-storage system and, now that you have broken your TRS-80, how to repair it, with all sorts of diagnostic programs and scope photos.

The book ends with lists of parts suppliers, bibliography, reference publications, byte values and their equivalents, and IC pinout diagrams.

This book is for the few who are rather bright and who really enjoy digging into the innards of the Model I TRS-80, unafraid to unscrew, cut, solder, drill and otherwise modify their machines. ☐



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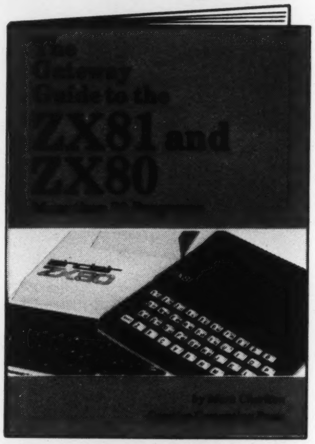
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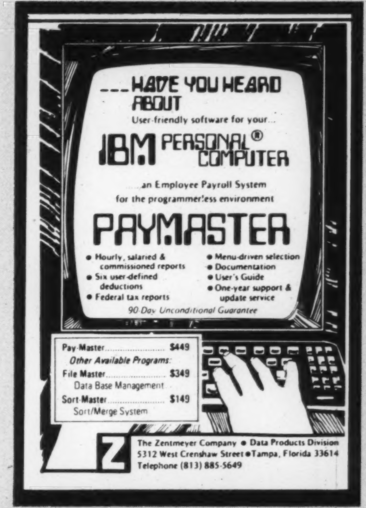

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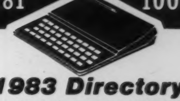

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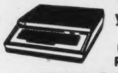

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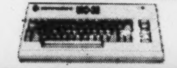

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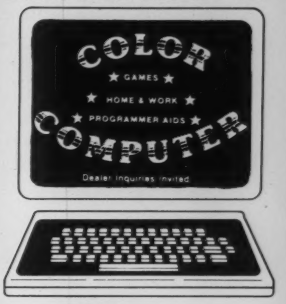

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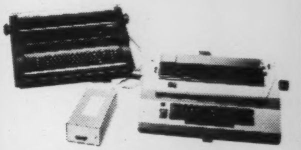

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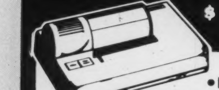

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COMPUTERLAND/OAK LAWN—10935 S. Cicero, Oak Lawn 60453; (312) 422-8080; IBM-PC, Apple, Atari, Osborne, Corvus, Dynabyte: Software, Peripherals.

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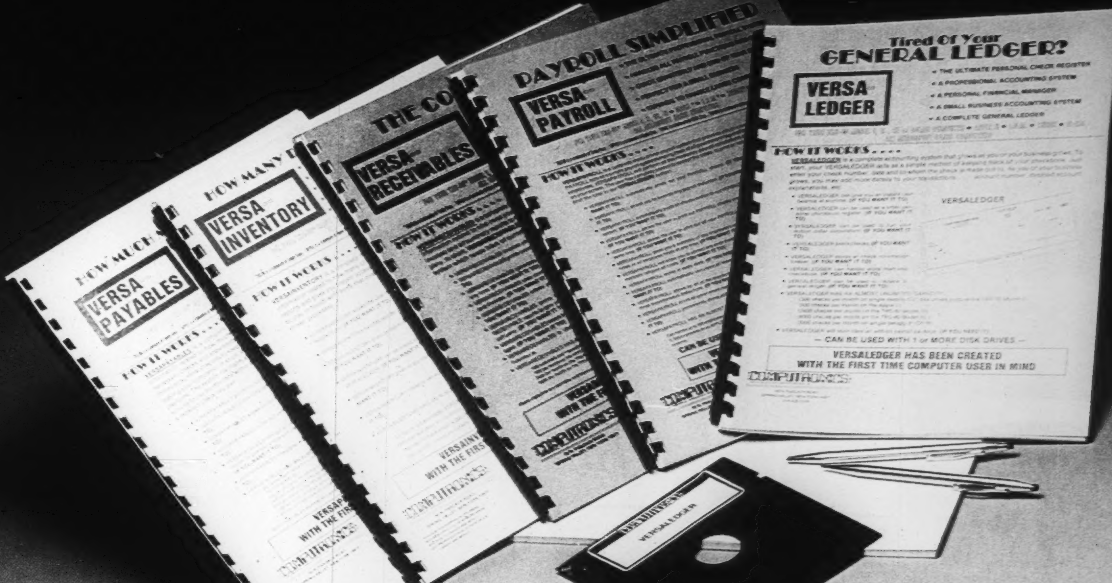

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